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THE AMERICAN SOCIETY OF ORTHODONTISTS

Serial
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ELEVENTH ANNUAL MEETING
HELD AT
BOSTON, MASS., SEPT. 20th, 21st, 22d, 23d,
NINETEEN HUNDRED ELEVEN

THE AMERICAN SOCIETY OF ORTHODONTISTS

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BOSTON, MASS., SEPT. 20th, 21st, 22d, 23d,
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Dates and Places of Meetings of
The American Society of Orthodontists.

First Annual Meeting held at St. Louis, Mo., June 11, 12 and 13, 1901.

Second Annual Meeting held at Philadelphia, Pa., October 8, 9 and 10, 1902.

Third Annual Meeting held at Buffalo, N. Y., December 31, 1903; January 1 and 2, 1904.

Fourth Annual Meeting held at St. Louis, Mo., August 29, 1904. At this meeting only routine business of the Society was transacted. There being no other program the proceedings were not published.

Fifth Annual Meeting held at Chicago, Ill., September 29, 30, and October 1, 1905

Sixth Annual Meeting held at New York City, December 27, 28 and 29, 1906.

Seventh Annual Meeting held at Detroit, Mich., October 2, 3 and 4, 1907.

Eighth Annual Meeting held at Washington, D. C., November 5, 6 and 7, 1908.

Ninth Annual Meeting held at Cleveland, Ohio, October 4, 5 and 6, 1909.

Tenth Annual Meeting held at Denver, Colo., July 13, 14 and 15, 1910.

Eleventh Annual Meeting held at Boston, Mass., September 20, 21, 22, 23, 1911.

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President's Address.

By Alfred P. Rogers.

"Happy are they who can hear their detractions and put them to mending."
Shakespeare.

In electing me President of this Society, you have given me the privilege of welcoming you to Boston; you have given me the opportunity of attempting something for the welfare of this Society. For this privilege and opportunity I wish to thank you.

If there is any virtue in this office, other than to conduct the meetings through the routine of business, it seems to me that it must be in attempting something for the Society that will prove of lasting benefit; something that will lend itself to the advancement of the cause; something, perhaps, that will make us more loyal to orthodontia and lead us into paths that will dominate us because of the truth that we shall find therein.

It is strange that we rarely ever accomplish precisely those things which we so often plan, after a flash of insight has revealed to us those blessings that might be ours for the effort. We live upon resolves that continue in succession until the end and few of us accomplish the smallest part of those things that we desire. This is needlessly so. Even, if sometimes true in our social life, it should not be true also in our professional. Therefore, my desire to-day is to plan with you some way in which we, as professional men, and as a society, may realize some of our ambitions.

A finely organized, efficient body of men, working in harmony with one grand object, free from professional jealousy, personal aggrandisement and narrow prejudices, is what this Society should strive to be.

From my study of the present conditions, and from what I have been able to gather by peering into the dimness of the future, I can readily see that we are approaching a crisis. If you will pause and reflect a moment, I think that you will indorse my feelings in this matter. Change must come with years. Just as each generation must interpret its facts of life for itself, and alter conditions to meet the needs, so also must we, as the years of our growth succeed each other, alter our conditions to meet the individual and society needs. It will be the course of wisdom, I believe, if we can exert the power of deciding, early, what direction the activities of this Society will take; whether or not we shall remain as we are, or masterfully direct the course of the Society to meet the new conditions. It may be difficult, but it can be done, and it is singularly well worth trying. Our thinking and our planning must be kept in living contact with the world progress of our profession, and new conditions of thought and conduct must call for new activities in the individual and in the society. The present epoch with us may be aptly compared to the young man just entering the activities of manhood, —if wise, he will measure conditions and equip himself to meet them. What the individual of this Society makes of his opportunity speaks well or ill for the future of this Society. If the individual member raises his tone, the Society will respond. I am sure that these considerations have at various times occurred to you, and that you are already in active sympathy with me. I hope that the result of your experience will correspond directly with my own, for I must confess, were it not for this hope, I should proceed with apprehension, fearing that possibly I might not be fully understood, or suspicious that some might feel that I had taken too much upon myself, or, that my efforts might prove absolutely ineffectual; but, feeling that I have at least that share of your sympathy which I crave, I shall close my eyes to these negative suggestions.

What I shall attempt to say has a bearing, not alone upon the technical processes of our work, but upon the general bearing of every individual. The logical consequences should be a general quickening of those forces that are behind all our efforts, individually and collectively. Should my remarks have the flavor of criticism, I trust that you will be mindful of its nature, for it is not my intention to set myself in judgment; if critical at all, I wish it rather to be considered in the light of creative criticism.

It has been said that the artist himself will do better work in proportion as he becomes his own most serious critic. Therefore, let us turn our eyes upon ourselves and indulge in a little introspection.

Efficiency.

Are we efficient—I mean efficiency in its highest sense? Are we handicapped in our work by conditions that might, by the use of a little thought, plus the exercise of a little will power, be overcome? Are not some of our partial or complete failures due to the lack of the perception of those qualities in us that might be made consciously our own? Let us think over what we have attempted during the past year. Do we hear that small voice chiding us because in some slight matters we have been negligent? Are we not mindful that times without number we have let slip details that now mournfully remind us that we have failed to do the best that was in us, and are we not startled when we are reminded that slackness soon becomes a habit, and that we are robbed of those splendid sensations that come to him who feels that he has done well? I believe it a worthy office to call attention to those resources that we may be unmindful of; those riches that lie undeveloped within us, which, when truly discovered, would place upon our heads the silver crown of achievement.

The Influence of Habit.

It is most important, in trying to reach a higher plane of accomplishment, that we should realize the important place which habit holds in all our efforts. Psychology helps us greatly in understanding these conditions. Nothing to my mind helps a man gain the mastery over himself more completely than a careful study and comprehension of the psychology of habit. When the term "habit" is used, the mind usually conceives the idea of evil or bad habits, but beneficent habits are those I wish you to think of at this time.

Because of the plasticity of the brain, we are creatures of habit. Everything we do, from earliest childhood until old age, becomes easier of accomplishment because of the character of our nervous tissue. If it were not so, how difficult and unprofitable would our every effort become. When full realization of this fact comes upon us, how forcefully are we impressed with the importance of correct manipulation, correct thinking, and acting.

Prof. James, in his chapter on "Habit," lays the whole matter clearly before us. Anyone, after reading this chapter, and not immediately improving his condition, is surely in a worse than hopeless situation. We are often of the opinion that habits of the beneficent kind, cannot be formed later in life, but this to my mind is an error. Of course, the longer one's efforts are delayed the harder and more bitter will the fight become, but with a determined and unflinching will, wonderful revolutions may be accomplished. Let me read you some extracts from the work of Prof. James, to whom I have just referred, for his words are so clear and his deductions so logical that I feel that my purpose will be far better fulfilled if I give you his words of authority:

"An acquired habit, from the physiological point of view, is nothing but a new pathway of discharge formed in the brain, by which certain incoming currents ever after tend to escape . . .

"Plasticity, then, in the wide sense of the word, means the possession of a structure weak enough to yield to an influence, but strong enough not to yield all at once. Each relatively stable phase of equilibrium in such a structure is marked by what we may call a new set of habits. Organic matter, especially nervous tissue, seems endowed with a very extraordinary degree of plasticity of this sort, so that we may, without hesitation, lay down as our first proposition the following: that the phenomena of habit in living beings are due to the plasticity of the organic materials of which their bodies are composed.

"Habits Are Due to Pathways Through the Nerve-Centres."

"If habits are due to the plasticity of materials to outward agents, we can immediately see to what outward influences, if to any, the brain matter is plastic. Not to mechanical pressures, not to thermal changes, not to any of the forces to which all the other organs of our body are exposed; for, as Nature has so blanketed and wrapped the brain about that, the only impressions that can be made upon it are through the blood, on the one hand, and the sensory nerve-roots on the other; and it is to the infinitely attenuated currents that pour in through these latter channels that the hemispherical cortex shows itself to be so peculiarly susceptible. The currents, once in, must find a way out. In getting out they leave their traces in the paths which they take. The only thing they can do, in short, is to deepen old paths or to make new ones; and the whole plasticity of the brain sums itself up in two words when we call it an organ in which currents pouring in from the sense-organs make, with extreme facility, paths which do not easily disappear. For, of course, a simple habit, like every other nervous event—the habit of snuffling, for example, or of putting one's hands into one's pockets, or of biting one's nails—is, mechanically, nothing but a reflex discharge; and its anatomical sub-stratum must be a path in the system. The most *complex* habits, as we shall presently see more fully, are, from the same point of view, nothing but connected discharges in the nerve-centres, due to the presence there of systems of reflex paths, so organized as to wake each other up successively—the impression produced by one muscular contraction serving as a stimulus to provoke the next, until a final impression inhibits the process and closes the chain.

"*Practical Effects of Habit.* First, habit simplifies our movements, makes them accurate, and diminishes fatigue.

"Man is born with a tendency to do more things than he has ready-made arrangements for in his nerve-centres. Most of the performances of other animals are automatic. But in him the number of them is so enormous that most of them must be the fruit of painful study. If practice did not make perfect, nor habit economize the expense of nervous and muscular energy, he would be in a sorry plight.

"Secondly, habit diminishes the conscious attention with which our acts are performed.

"Habit is thus the enormous fly-wheel of society, its most precious conservative agent. It alone is what keeps us all within the bounds of ordinance, and saves the children of fortune from the envious uprisings of the poor. It alone prevents the hardest and most repulsive walks of life from being deserted by those brought up to tread therein. It keeps the fisherman and the deck-hand at sea through the winter; it holds the miner in his darkness, and nails the countryman to his log-cabin and his lonely farm through all the months of snow; it protects us from invasion by the natives of the desert and the frozen zone. It dooms us all to fight out the battle of life upon the lines of our nurture or our early choice, and to make the best of a pursuit that disagrees, because there is no other for which we are fitted, and it is too late to begin again. It keeps different social strata from mixing. Already at the age of twenty-five you see the professional mannerism settling down on the young commercial traveler, on the young doctor, on the young minister, on the young counsellor-at-law. You see the little lines of cleavage running through the character, the tricks of thought, the prejudices, the ways of the 'shop,' in a word, from which the man can by and by no more escape than his coat-sleeve can suddenly fall into a new set of folds . . .

"The great thing, then, in all education, is to make our nervous system our ally instead of our enemy. It is to fund and capitalize our acquisitions, and live at ease upon the interest of the fund. For this we must make automatic and habitual, as early as possible, as many useful actions as we can, and guard against the growing into ways that are likely to be disadvantageous to us, as we should guard against the plague. The more of the details of our daily life we can hand over to the effortless custody of automatism, the more our higher powers of mind will be set free for their own proper work. There is no more miserable human being than one in whom nothing is habitual but indecision, and for whom the lighting of every cigar, the drinking of every cup, the time of rising and going to bed every day, and the beginning of every bit of work, are subjects of express volitional deliberation. Full half the time of such a man goes to the deciding, or regretting, of matters which ought to be so ingrained in him as practically not to exist for his consciousness at all. If there be such daily duties not yet ingrained in any one of my readers, let him begin this very hour to set the matter right."

"Two great maxims emerge from his treatment. The first is that in the acquisition of a new habit, or the leaving off of an old one, we must take care to launch ourselves with as strong and decided an initiative as possible. Accumulate all the possible circumstances which shall re-enforce the right motives; put yourself assiduously in conditions that encourage the new way . . ."

"The second maxim is: Never suffer an exception to occur till the new habit is securely rooted in your life."

"In the main, however, all expert opinion would agree that abrupt acquisition of the new habit is the best way, if there be a real possibility of carrying it out. We must be careful not to give the will so stiff a task as to insure its defeat at the very outset; but, provided one can stand it, a sharp period of suffering, and then a free time, is the best thing to aim at."

"A third maxim may be added to the preceding pair: Seize the very first possible opportunity to act on every resolution you make, and on every emotional prompting you may experience in the direction of the habits you aspire to gain. It is not in the moment of their forming, but in the moment of their producing motor effects, that resolves and aspirations communicate the new 'set' to the brain."

"The actual presence of the practical opportunity alone furnishes the fulcrum upon which the lever can rest, by means of which the moral will may multiply its strength, and raise itself aloft. He who has no solid ground to press against will never get beyond the stage of empty gesture-making."

"Just as, if we let our emotions evaporate, they get into a way of evaporating, so there is reason to suppose that if we often flinch from making an effort, before we know it the effort-making capacity will be gone; and that, if we suffer the wandering of our attention, presently it will wander all the time. Attention and effort are, as we shall see later, but two names for the same psychic fact. To what brain-processes they correspond we do not know. The strongest reason for believing that they do depend on brain-processes at all, and are not pure acts of the spirit, is just this fact, that they seem in some degree subject to the law of habit, which is a material law. As a final practical maxim, relative to these habits of the will, we may, then, offer something like this: Keep the faculty of effort alive in you by a little gratuitous exercise every day."

"So with the man who has daily inured himself to habits of concentrated attention and self-denial in unnecessary things. He will stand like a tower when everything rocks around him, and when his softer fellow-mortals are winnowed like chaff in the blast."

"He can, with perfect certainty, count on waking up some fine morning, to find himself one of the competent ones of his generation, in whatever pursuit he may have singled out. Silently, between all the details of his business, the power of judging in all that class of matter will have built itself up within him as a possession that will never pass away."

All this applies not only to the motor habit but to those of thinking and feeling as well. I think you will realize the importance of all of this to us. Our work is so intricate that the habits of feeling, thinking and doing make us or mar us, and we become efficient or inefficient, so also will our grand work be stamped as worthy or worthless.

If we become proficient in the application of these principles to our daily work, we shall become the more competent in applying these same principles to the correction of habits of an evil nature as we meet them in the young who come under our care. No one knows better than we the havoc that may be wrought to the structural growth in young children, and no one should more quickly recognize the good that comes from their detection and successful treatment. Let us grasp these truths and reflect upon them, that we may allow them to influence our conduct unto the last, that the fulfilment of our efforts may add blessings to future generations.

Now, what is the situation with us? I asked you in the beginning if you felt we were truly efficient. I ask you again, if after all that has been said, you do not think we can raise our efficiency a little higher? If you are able to recall those moments during the course of your life when you have striven to gain an ideal, you will remember that some zeal possessed you; some overpowering thought urged you on until from point to point you rose to greater efficiency. I feel at this moment that there is among you that kindling zeal that will carry each member of this society to a plane of greater accomplishment.

Restriction of Membership.

We, for the most part, believe that our highest ideals are reached by devoting our time and efforts to the accomplishment of our specialty. There is not a man of experience here who does not believe that special effort means special achievement, and at least every one believes that this society should be as honest in its representation of the special as the individual. It is my earnest desire, then, that we shall now declare ourselves in league with the highest, and that this Society shall so change its constitution and by-laws that there can be no doubt about its position. It is my firm belief that no member will place himself in opposition to true progress by any promptings of a selfish nature.

Some, in times past, have felt that our doors should be flung wider open, but this Society does not exist that the many may receive a little benefit by gaining membership, but that the few may have opportunity and inspiration to carry the science higher, that in the end the multitude may have an ideal towards which to bend their efforts. Do not misunderstand me—I do not seek to establish an aristocracy in orthodontia, but rather an academy, which, as the years go past, shall gather unto itself every advantage that shall make for the advancement of orthodontia. I, therefore, urge that the following changes be made in the constitution and by-laws:

In Article 3, Section 1, the last clause shall be omitted. The article shall then read: "No person shall be eligible for active membership except those engaged in the exclusive practice of orthodontia."

I would suggest also that Section 2 be reconsidered by this Society, and some decision arrived at as to the advisability of continuing the admission of honorary members. This section, I believe, if not omitted entirely, should in some way be modified.

That, in Article 4, Section 1, lines 8 and 9 be reconstructed so as to read: "and report its decision to the Society during the next annual session." The article will then read: "All names of candidates for membership shall upon the recommendation of two active members be presented to the Board of Censors, which shall pass upon the eligibility of said candidates and report its decision to the Society during the next annual session when the active members shall proceed to vote by written ballot, a two-thirds vote of all active members present being necessary to elect."

I would also recommend that Section 4 in the By-laws be revised in such a way that papers shall be more carefully passed upon before they are admitted to be read before the Society or for publication.

Ethical Relations with Specialists and Practitioners.

I wish to recommend that attention shall be given to the ethical relations existing not only between the members of our own society, but with those of the general practitioner as well. Some have been deeply troubled and perplexed over mal-adjustments and misunderstandings involving questions of an ethical nature. The splendid success of our work and its prompt recognition by the laiety, in contrast to the stubborn acceptance by a few of the older general practitioners has, in some few cases, given rise to unpleasant experiences, which, if the right spirit prevailed, would be accepted as in the course of true progress. Selfishness, I am sorry to say, is the cause of a form of criticism, and is anything but pleasant. In view of the fact that the modern growth of our work has a tendency to revise many traditions, it is not surprising, I suppose, that our progress should give grave concern to a few who are either unwilling or unable to accept the inevitable extension of the orthodontist's influence. It not infrequently happens that children are referred to the orthodontist, not by the family dentist but by the family physician, or the rhinologist, or by the parents and friends of the children who have been, or are, under treatment. In some cases such as this, it happens that the dentist has taken exception. When this has happened, I have observed that it is usually in the case of the man who has held himself aloof from the orthodontist and his work and whose mind is not open to the benefits of special work. These cases are fortunately few, and the result is identical with that which follows in any other profession where attempts are made either from selfish or sincere motives to stand in the path of eternal progress.

In considering the intercourse which must become more and more intimate, as the magnitude of our work grows, ethical principles must be well understood. The truest conception of ethical relations between men is, "Do unto others as you would have them do unto you." I have no doubt that most of us realize the necessity of the practical acceptance of this truth, but are often deterred by the stress of work, and forced to neglect by the paralyzing influence of tired nerves. Nevertheless, we must look at the matter fairly and possess ourselves with the idea that we must in every case possible give due consideration to the other man; acknowledge the reference of patients promptly, and make efforts for a mutual understanding with the family dentist, that shall allow him an opportunity to administer whatever services become necessary. The same ideas hold true in regard to the interchange of patients taking place between the orthodontists themselves. Care must be taken by the one referring to notify the man of his choice before the arrival of the patient if possible, and, in those cases where it is necessary, the models of the case should be forwarded as early as possible.

Interference by Head Master and School Mistress.

Steps should be taken to acquaint the preparatory schools with the disastrous effects often caused by the thoughtless interference with the orthodontist's work. The schoolmaster, as a rule, knows little or nothing about the work of the orthodontist from a scientific point of view. He looks upon the whole idea as an undesirable proceeding, unless perchance he may have a child of his own who may be in serious need of treatment. It is annoying to him to have the boys leave school. In some instances, everything has been done to limit the pupil's visits, even appeals to the parent that the child's scholarship is interfered with, on account of time lost in weekly visits. Some of our men have been so handicapped by this attitude of the schoolmaster that the cases have resulted in needless failure and needless suffering on the part of the patient. There never was a situation so difficult, but that some way could be found to relieve it. Although I realize that this condition is, in many cases, a discouraging one, I believe that harmony can be procured in all but a few exceptions. The preparatory schoolmasters with whom I have come in personal contact have, for the most part, been fair and generous when they have become acquainted with the scope of our work, and are led to see what the skilful orthodontist can accomplish for the young under their care. Of course, we on our part must not forget that the schoolmaster is in a great measure responsible for the boys and girls under his care, and we should endeavor to make our demands on the pupils' time as limited, and as convenient, with relation to the school schedule, as possible. The master should know the dangers likely to follow interference on their part and at the same time be made conversant with the nature and scope of our efforts. He must not be allowed to think that we are in the least selfish in this matter, or that financial considerations prompt us. There are few of us, if we were to consult our own feelings in the matter, who would not much rather not accept patients who are, or expect soon to be, students in the average preparatory school. It is a rule with but few exceptions, I believe, that the orthodontist is devoted to his patient's welfare, and his most earnest desire is that the final results shall be worthy of an artist. Therefore, interference which makes these results impossible is, indeed, hard to bear. The matter should be tactfully adjusted for pedagogic prejudice is hard to overcome. Let us first try to brush aside the misconceptions that arise, then show that our attitude is one of unselfish interest, prompted by loyalty to the cause we serve.

The First School of Orthodontia.

The subject which involves all other subjects, the one that underlies the future theory and practice of orthodontia, I wish next to place before you as a topic for your reflection. It seems at variance with all the principles that should be possessed by thoughtful and mature minds that the fundamental idea of institutional education should so long lie dormant in this society. I am not a little puzzled when I reflect upon this condition. It seems untenable that slight early differences of opinion should in any way affect the attitude of any member toward an institution of such remarkable achievement as the first school of orthodontia. It is my hope that this society henceforth shall lend its support and encouragement to the establishment of the first school upon a permanent and sufficient basis. It is upon the educational idea that our whole structure is reared. Future scientific conceptions, the development of manipulative power, the acquisition of knowledge of all kinds pertaining to our science must and shall have a permanent and beautiful home, where our progress may be advantageously measured, and where those coming after may receive the fruits of the experience of those who have passed before them; where young men shall continue to receive that inspiration which has been and continues to be the foundation of many successful careers.

Discussion of President's Address.

Dr. E. H. Smith.

Mr. Chairman and Gentlemen: It gives me great pleasure to be considered by your censors worthy to discuss this very interesting paper by your President, who with characteristic frankness has asked me to take a free rein in its discussion. Like all good presidents he is desirous, if it be possible, to do something for his society that will make its members more loyal to orthodontia. I suppose by that that you are not as loyal as you should be. How few of us are really downright loyal to anything! We live in a complex age and a comparatively few tried men are striving to better existing conditions. Not only your society, but every society should strive to be a finely organized efficient body of men, free from all that is mean and small. To emphasize this, your President quotes freely from the writings of Professor James, and in this way clearly puts before us the subject of efficiency and the psychology of habit. Think how many lives have been wrecked on the shoals of inefficiency! We cannot too often put before the young, and even the old, the lesson of efficiency and habit.

Naturally your President assumes that your highest ideals are best reached by devoting your time and your efforts to the building up of your specialty.

To this end he recommends that a change be made in your constitution and by-laws so that no person shall be eligible to active membership except those engaged in the exclusive practice of orthodontia, and he further recommends that the membership made up in this way should lend its support and encouragement to the first school of orthodontia, meaning, I suppose, the Angle School of Orthodontia.

It is right here that I beg to avail myself of the privilege that he grants me and differ with him. It seems to me that your President's usual broadmindedness has been unduly influenced and restricted by his love for his specialty and his zeal for more real productive work on the part of the members of this Society.

Your society should rightly demand for membership men of distinction in the science of orthodontia. Not necessarily men who have taken practically an oath to practice orthodontia exclusively.

There are many able men to-day who are practising orthodontia safely and well in connection with general practice; men in our country towns and out of the way hamlets, caring for children afflicted with malocclusion, who could not possibly come to our great centers where the present orthodontia specialist finds his home.

I know some of these men, and I know some of the good work that they are doing in orthodontia and of their great interest in the science of malocclusion. Such men might want the benefit to be derived from membership in such a society as yours and they might, in their turn bring much that would be valuable to you.

Your doors should always remain open to such men. Had restrictions such as your President recommends obtained in any society of scholars, Professor James, whom your President so much admires, would have been obliged to remain an outsider, for he obtained his wonderful knowledge from following various channels of learning, no one of which led him to an academic degree. It is true he graduated from the Harvard Medical School with the degree of M. D., but that was at a time when the training required for the practice of medicine was quite different from what it is to-day.

Division of Fees Immoral.

On the question of the ethical relation between the general practitioner of dentistry and the specialist in orthodontia I have decided and strong views, especially so in regard to the division of fees. I hold it to be morally wrong for the general practitioner to receive one cent of pay from the specialist, for a patient that he may have sent to the specialist, and the specialist who makes any such arrangement for the division of fees with the general practitioner should be expelled from membership in your body.

Post-graduate schools in orthodontia will surely rise and, together with the departments of orthodontia in our better established dental schools, will recruit the ranks of orthodontists, some of whom will devote their entire time to the practice of orthodontia, while others will, as many now do, make it a part of a general practice.

By all means restrict and guard your membership, but do it in a broad way befitting a liberal profession. Let us remember the cry of the Chambered Nautilus and apply its lesson to our every-day life.

"Build thee more stately mansions, O my soul,
As the swift seasons roll.
Leave thy low-vaulted past,
Let each new temple, nobler than the last
Shut thee from heaven with a dome more vast,
Till thou at length art free,
Leaving thine outgrown shell by Life's unresting sea."

Dr. Dunn.

I am greatly pleased and gratified at the President's address because, although we live many thousands of miles apart, he has dwelt upon many things I had in mind before coming here, of which the raising of the standard of our Society and the question of membership are the most important.

It appears to me that the point that he has brought out in relation to the Constitution and By-Laws is one worthy the attention of the Society and, in my belief, the rule should be so changed, and later even changed in a more radical manner.

One other point he dwelt upon, which I know from my own experience is well taken, as I have been very unfortunate indeed, is the attitude of the preparatory schools, especially in this section of the United States, toward our patients. I have a great number of children who come to this section of the United States to obtain their education, and they come in different stages of treatment. In a very large percentage of these cases they have not been permitted to visit competent men in this vicinity, with the result that when they have returned home on their summer vacations their teeth have been found to be in a horrible condition. It has seemed to me that the Society might adopt some method of educating the heads of these preparatory schools, so that those who come a great distance might receive the attention which they need, and at the proper times. I do not know that I can at this time suggest the mode of procedure this Society might take, but probably a suggestion may be made by some member by which this difficulty may be obviated, and the children in the schools obtain the treatment which they require.

Dr. Abell. I do not feel competent to discuss this question as it should be discussed, but it is one which appeals to me—the relation of the orthodontist and the public educator. In our schools in Toledo it is almost impossible to get the patient into the office during school hours, because of the attitude of the teachers, and the question has arisen in my mind whether it would be ethical on the part of the orthodontists to endeavor to place the work before the teachers of the schools in a meeting of the teachers, explaining what orthodontia is, what it has done, and what it is trying to do. I do not know whether it would be counted as advertising and be criticised, or whether it would be accepted as an advance step in the present movement of dental education. I think it is entirely possible, at a meeting of the teachers, to explain this matter, so that they will thoroughly understand it and so obliterate, in a measure, the feeling against orthodontia. I would like that matter discussed.

Another point is the relation of the orthodontist to the dentist—that part of the President's address strikes me very favorably. I find that a man in our town, who has the opportunity, looking at it from my standpoint, to do a great deal for orthodontia, feels that if a band is left on a tooth for a year that the tooth will be destroyed. He is a prophylactic man, and is an extremist. I believe it is sometimes necessary for the orthodontist to do his best to educate the dentist.

The fee of the orthodontist and the dentist, it seems to me, can be very amicably settled, if the dentist receive a fee for his services, for just what he does; that can be arranged between the orthodontist and the dentist. I have people who come from all over Ohio. It is almost impossible for them to come to me once a week, and it is therefore necessary to ask the dentist to take care of the patients between visits to me, and it is understood that the dentist is to receive a fee for the work that he does for the patients, under the direction of the attending orthodontist.

Dr. Hawley. In regard to patients getting leave from school, in Washington I have been, perhaps, a little differently situated from some others, on account of the great number of private schools there; very many of the patients receiving treatment in orthodontia are in them, and practically all announce that the pupils will not be released for dental attention during the school term. It has been understood that the filling of teeth must be done at home, and I had quite a little trouble when I first went to Washington. I think it is a question that must be settled personally at the beginning of the treatment. All of these schools have a chaperone, who is usually a very intelligent person, and if I cannot see the principal, I have approached the chaperone, explaining what this work is, its importance, and that it is entirely different from ordinary dental work. Where I have been able to do that I have had no trouble at all. I have placed the matter before them in such a way as to show them that this treatment will bring a great many people to Washington. Washington has many pupils from all over the South and West, from cities which have no specialist, and it is a matter that will be to the school's advantage if the pupils can be allowed to visit an orthodontist for treatment. Two of the largest private schools in Washington now look very kindly upon this matter and willingly give their pupils time for this work.

In the public schools I have had to deal with the parents, and through the parents with the teachers, and I have handled the matter in that way more successfully than any other.

In regard to fees, I presume Dr. Smith is not aware of the provision we have in our constitution, that was adopted some years ago in New York, against the dividing of fees. No person can hold his membership in this Society and give commissions or divide fees. The subject was thoroughly discussed at that time, and I think that none of us has changed his opinion.

Habits. There is a matter suggested by the paper that has occurred to me as a very important one, and that is the influence of habits, especially the habits of children up to 8 or 10 years old. A habit has, I think, a great deal more influence than we realize.

The habits that produce malocclusion are easily acquired, and I think we need to take a great deal of care not to produce other bad habits during treatment. Also, I have come to think it a serious matter to place appliances in the mouth, which break up the habits of mastication which the child has already acquired. It is difficult to produce proper habits of mastication; at least it does not seem easy with the present preparation of food. If we place an appliance in the mouth for a year, which tends to break them up, it is not easy when the treatment is over for the child to take them up again; and I think it is a matter which should receive very careful consideration in the treatment of a case. For this reason also the treatment of a child's teeth should be as brief as possible, consistent with other considerations.

Dr. Rogers. Fellow Members: Although some of the speakers have seemed in slight opposition to the things I recommended, yet I cannot help feeling that when the address is read carefully, you will all come to the conclusion that we agree quite thoroughly. Dr. Smith was impressed with the idea that, possibly, in recommending some of these things, I had assumed a narrower position than was my usual custom, but I think you will find that our recommendations are almost identical. If you read the paragraph in regard to specializing in orthodontia you will see that the idea is, that by limiting ourselves to this specialty, the value of orthodontia shall be greatly enhanced. I distinctly say that we should be in a position to shape an ideal towards which the multitude may strive.

The reason why I would like to have an academy, whose members are high-class specialists, is that as their work is given to the world, all those attempting orthodontia might have a more authentic guide than they have at the present time.

My idea in referring to the first School of Orthodontia is one of loyalty. There is no man who has attended this school who is sorry that he went there, and, with very few exceptions, the men who have attended have done good work in orthodontia. Therefore, I asked that we give the school our sympathy and support, because my feeling towards it is one of loyalty, and I cannot see wherein any man can take exception. There may be other efficient schools in orthodontia established in other parts of the world, therefore my idea is not in any way to narrow the influence of orthodontia or that of the Society at all, but to give emphasis to the idea of efficiency.

I realize that some general practitioners can do as good work as some so-called specialists; but I also say "If that man should devote himself to orthodontia, how much better work he could do!" It is being recognized by men of thought that orthodontia has an important place in this world, and that the work should be done well. I have known of too much suffering among the children not to wish the Society to get together and use all its influence toward good work.

You will find that most of the great discoverers in the world are men who have worked for years in a laboratory; they were not bothered by the outside world, and it seems to me that our work, as a society, could be better done by a nucleus, and then, if found sufficient, spread broadcast.

The Technique of Efficient Application of Fixed Appliances in the Correction of Malocclusion.

By Dr. J. Lowe Young, New York City.

Fixed appliances of different varieties have been in use a great many years for the correction of malocclusion, but previous to the systematizing and standardizing of these appliances into a few simple, practical and efficient forms by Doctor Edward H. Angle, their application was very complex, impractical and inefficient.

The forms which he advocated for the correction of malocclusion comprised chiefly the expansion arch and molar clamp bands, and the leading orthodontists of to-day are using these same simple forms for treatment of the simplest, as well as the most complex, cases of malocclusion.

Certain principles of fixation of appliances are involved in their use; first, the inherent power in the appliance to hold to the teeth, so that the patient cannot remove it, such as in the clamp band, and second, the use of phosphate cements to increase this holding power, as well as to prevent deterioration of tooth surfaces under bands, which otherwise would be possible.

With these general ideas of fixed appliances in mind, a description of these simple forms of fixed appliances, previous to the description of their efficient application for tooth movement, will not be *inapropos.*

Clamp Bands. First in importance relative to the fixation principle, is the clamp band, which, by reason of the principle of the screw and nut, is mechanically most effective in being a "fixed" band, adding this power to that of the cement in holding to the tooth.

Clamp bands are furnished by the supply houses under the following designations: D, X, No. 1 and No. 2. The D band is used on the molars, and has a tube soldered to the buccal side to receive the end of the expansion arch. X bands are used on bicuspids, and also have a buccal tube. The No. 1 band is the same as the X band without the buccal tube, and the No. 2 band the same as the D band without the buccal tube. The D bands are made in three sizes: small, medium and large. In the proper adjustment of these clamp bands, and in their correct adaptation to secure greatest efficiency, it is desirable that the following successive steps be pursued:

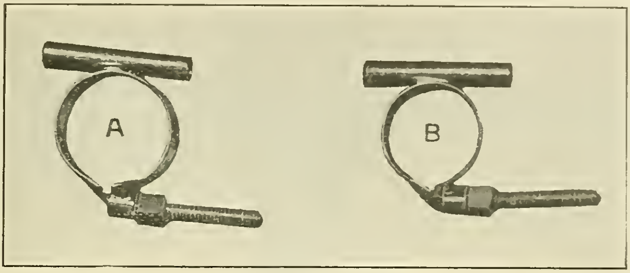


Fig. 1

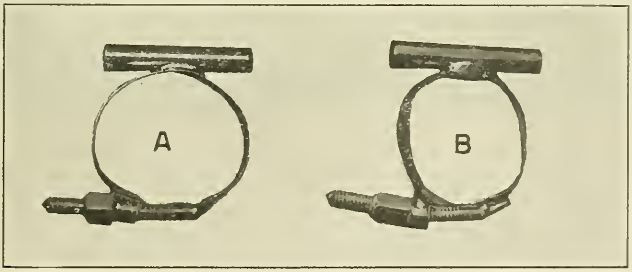


Fig. 2

To facilitate the adjustment of the clamp band it is advisable to get a slight separation, both mesial and distal (if there be a tooth distal) to the tooth which the band is to encircle. This may be done by passing a heavy ligature wire through the interdental space, bringing the two ends together and twisting them tightly around the approximal contact points of the teeth to be separated. If this wire is worn for a few days there will be sufficient separation so that the band may be easily worked to place, except in some adult cases which may require some other method of tooth separation.

In these cases as well as in younger cases, ligature silk has been found very efficient for this purpose, and is used as follows: A double strand of fine floss silk, engaging a loop of ligature silk, No. 3, is passed by the contact points, and the loop of the ligature silk is drawn through the interdental space to the buccal side, leaving the two free ends presenting lingually. The floss silk is then removed, leaving the ligature silk between the teeth. One end of the ligature silk is passed through the buccal loop, the other end is grasped and drawn taut, and the two securely tied together around the approximal contact points, clipping the surplus ends. Through the shrinkage of this silk ligature, sufficient space for the easy fitting of the clamp band may be obtained in any case.

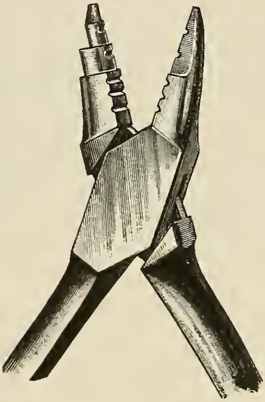


Fig. 3

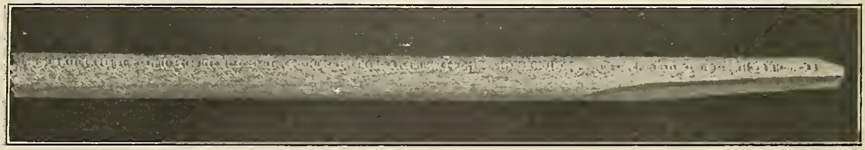


Fig. 4

Technique of Adjusting the Clamp Band.

Fig. 1 represents a D band as supplied by the trade. If the nut of this band were loosened up sufficiently to allow it to be forced over the molar tooth, the edge of the band would impinge on the gum and cause unnecessary pain. To obviate this, the edge of the band that presents to the gingiva should be shaped as shown in Fig. 2, with a plier designed for the purpose (Fig. 3), and the mesial portion of the band should be flattened in such a way that when forced over the tooth the lingual screw will lie very close to the lingual surface of the second bicuspid. A piece of dowel wood, shaped as in Fig. 4, is very serviceable in forcing the band to place without bending the edge of the band. As soon as the band touches the gum so as to cause any annoyance, it should be clamped on the tooth by turning up the nut with a suitable wrench, thus making the band conform somewhat to the shape of the tooth. The nut must now be loosened up sufficiently to allow the band to be carried well toward the gingiva and then reclamped by turning up the nut.

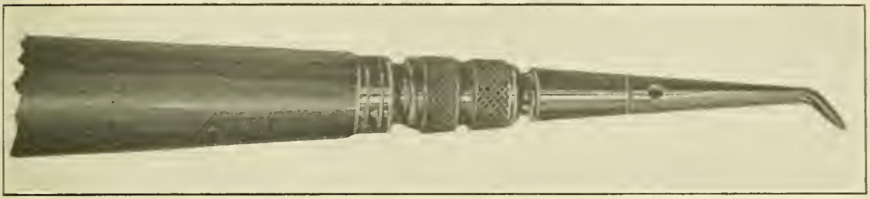


Fig. 5

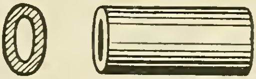


Fig. 6

The occlusal margin of the band should also be made to conform to the tooth, and the instrument (shown in Fig. 5), devised by the writer, has been found very suitable for the purpose. It has fine serrations on each of two sides to prevent it slipping while pressing the band to place. The edges are left smooth, so that these parts of the instruments may be used as burnishers. This instrument is also very useful in removing various bands and in pressing plain bands to place when cementing them.

Adjustment of Buccal Tubes.

The next step in the efficient adaptation of the clamp band is the determination of the position of the buccal tube. If this tube is not correctly placed it will be impossible to properly adjust the expansion arch. The proper location of this tube is of such great importance that it would seem advisable that it should be sold separately, so that it might be soldered on after the band is fitted; for only in a small percentage of cases in which the tube is already attached will it be found to be in the correct position when the D band is properly adjusted.

Buccal tubes of some makes can be procured separately, but the best buccal tube for general use is that devised by Dr. Angle to accommodate the friction sleeve nut.

Wherever much expansion is required in the molar region, the buccal tubes should be of such shape as to prevent the expansion arch rotating in them, thus obviating tipping of the anchor teeth (Fig. 6). The mesial end of the tube should be in such a relation to the band as to allow the nut on the arch to occupy the buccal embrasure between the anchor tooth and the tooth mesial to it, as in Fig. 7. If, for any reason, this is impractical, it is then advisable to solder the distal end of the tube to the mesio-buccal corner of the molar band, and thus bring the nut in the buccal embrasure one tooth mesial to the anchor tooth, as shown in Fig. 8, necessitating also the use of a shorter expansion arch.

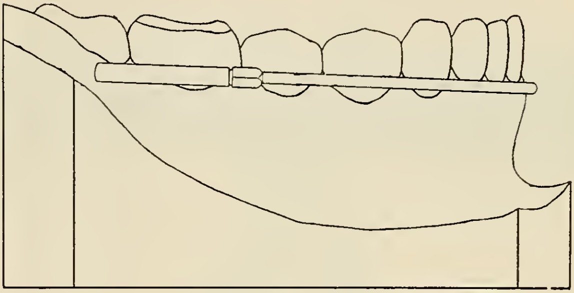


Fig. 7

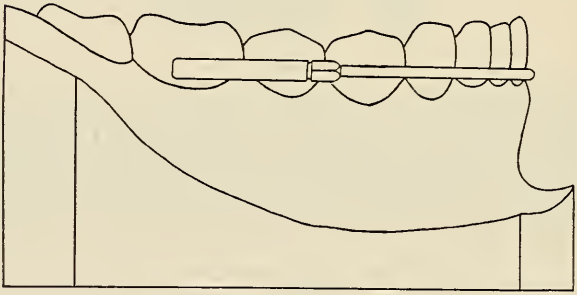


Fig. 8

The direction of the tube, with very few exceptions, should be such as to cause the arch when placed in the tubes to lie very close to, if not in contact with, the buccal surfaces of the teeth mesial to the anchor tooth. The directions of the tube on each band should so harmonize that when one end of the arch is inserted into the tube that is to receive it, the other end of the arch will lie on the same plane from both a vertical and horizontal view, with the tube of the opposite side, unless for some good reason, subsequently to be stated, a different position is advantageous. The tubes should be so placed that, with few exceptions, no bending of the expansion arch is required in order to have it assume its proper position in the anterior region, *i.e.*, at the gingival border (Fig. 9).

Where the anchor bands are fastened to the first permanent molars and the deciduous cuspids and molars are in place, it frequently happens that in order to prevent the expansion arch from impinging on the gum tissue the direction of the buccal tubes must be such that it will be found

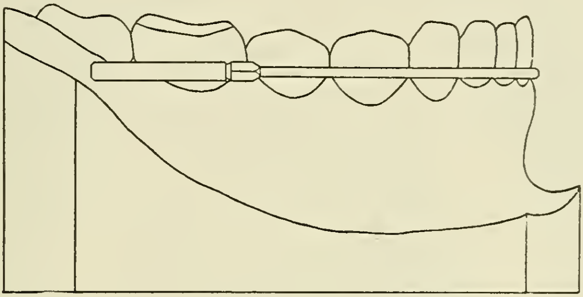


Fig. 9

necessary to bend each lateral half of the expansion arch just distal of the cuspids, in order that the front portion of the arch may assume its proper position in the incisor region.

In order to place the buccal tubes as stated above, the band must be unclamped, the tube unsoldered, and resoldered in the desired position. The band must then be reapplied and reclamped to be certain that the position of the buccal tube is correct. If found so, the band must now be removed and the tooth thoroughly polished, so as to free it from all deposits and secretions.

Cementation of Clamp Bands.

The band may then be cemented on the tooth and securely clamped. As a cementing medium, Evans's Orthodontia Gutta Percha has been found very advantageous, as it is not necessary to have the tooth dry, and there is absolutely no danger of the gutta percha dissolving out.

If a zinc phosphate is to be used for cementing these bands in place, a semi-hydraulic cement should be selected. In using such a cement it is not necessary to have the tooth perfectly dry; in fact, the cement will be stronger and better if there is a slight moisture on the tooth. However, cement cannot be depended on to adhere to a tooth from which all mucus has not been removed.

The cement is mixed by first pouring out the required quantity of liquid on the glass slab; a small portion of powder is added to this liquid from the bottle, by rolling it between the thumb and finger. This powder should be thoroughly mixed with a suitable spatula before any more powder is added. The longer this mixing process is continued up to one minute, the slower the cement will set. Then little by little more powder is dusted out of the bottle and thoroughly spatulated until the proper consistency is attained. At this point of the procedure the tooth should be sprayed with some alkaline solution and the patient instructed to rinse the mouth with an alkaline solution. This part of the work should be attended to by the assistant. The band is now filled with this cement, and the occlusal orifice of the band closed either with the finger, or better, a piece of No. 60 tinfoil. This causes the surplus cement to escape from the gingival orifice of the band, and removes considerable of the moisture, leaving just the amount required by such a semi-hydraulic cement.

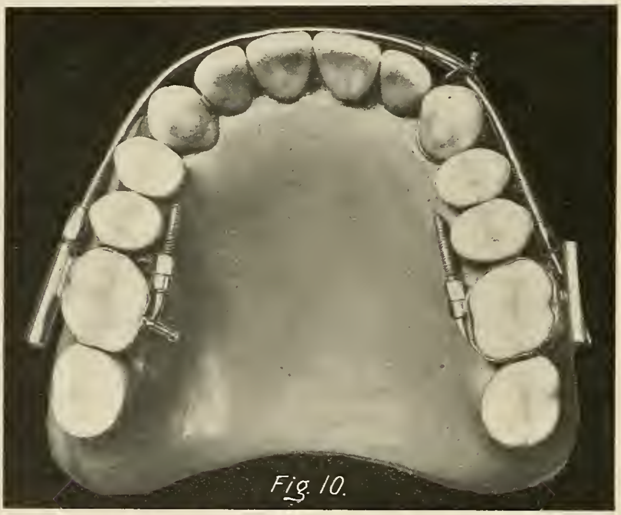


Fig. 10.

The band on the opposite side is now adjusted in like manner. By means of the expansion arch the direction of the buccal tube is now determined. This is done by inserting one end of the expansion arch into the buccal tube of the cemented band, and holding the other end of it in its proper relation to the teeth on the opposite side, and noting the relation this end of the expansion arch bears to the buccal tube that is to receive it. If found, as in Fig. 10, and resoldering of the buccal tube is neglected, when the arch is sprung into position, it is inevitable that the molar on this side will be rotated. In some cases the buccal tubes can be readjusted without soldering, by using an instrument devised by Doctor Josep Grunberg, and shown in Fig. 11. When this tube is so adjusted that the arch will lie on the same plane with it from both a vertical and horizontal view, the band is ready to be cemented in place. It is always well to mark one end of the expansion arch in some way, so that it can be placed in the same tube each time.

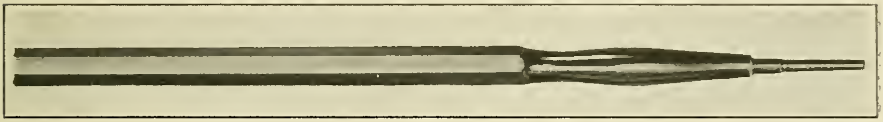


Fig. 11

Technique of Adjusting Plain Bands.

As it is found necessary to fit a number of plain bands, it is desirable that the material for these bands should be as thin as possible, and yet be staple. Platinum and iridium, ten per cent. of the latter, has been found by a great many to be the most desirable metal for this purpose. It may be used as thin as .002 of an inch. Some operators have condemned this material on account of being too stiff. This stiffness can be overcome by annealing the roll of band material in an electric furnace. Fifteen-hundredths of an inch in width is a very serviceable size. Before shaping the band, one side of the strip of metal should be roughened by drawing it over a round file. The strip with the roughened side presenting inward should next be worked carefully around the tooth and well burnished to the lingual surface. It is then held with the thumb and finger and pinched with a suitable plier, so as to make it conform accurately to the shape of the tooth. After it is soldered in the usual way, a spur should be attached, as desired, for the case in hand.

The wire to be used for making such a spur should be as light as possible, and never should be heavier than the heaviest ligature wire. And if made from fifteen per cent. platinum and iridium, it can be lighter than this heavy ligature wire. Care should be exerted in placing the spur, so that when the ligature passes from the spur to the expansion arch, the tendency will be to withdraw the tooth from the socket rather than to depress it therein. Bands of such thickness are so flexible, that when soldered with pure gold they can be made to fit very closely, nearly all of the ten anterior teeth in each arch. On fitting bands to partially erupted cuspids, it often becomes necessary to crimp the band by pinching on both the mesial and distal portions, in addition to the regular lingual pinch usually required on a cuspid band. Bands for the upper laterals usually require a small pinch at the disto-incisal angle. Where such extra crimps are necessary, solder should be used to unite the pinched surfaces, and the surplus material trimmed away, and the ragged edge filed and polished. After the tooth to be banded is cleaned and polished, and the cement is prepared as described above, the band is filled with the cement and forced over the tooth. The lingual surfaces of the bands on each anterior tooth should be accurately burnished, so as to leave as thin a layer of cement between the bands and the tooth as possible. This is for a double purpose, first, so as to lessen the probability of the lower teeth wearing through the bands on the upper anterior teeth; second, so as to force the cement around the approximal portions of the tooth, where it may have been forced out by the band passing over the contact points. After this burnishing, the band should be forced to its final position, with a suitable driver by first pressing it on the lingual side of the band and then on the labial, using also light taps of the mallet to secure perfect adaptation.

Banding Bicuspids.

For some years I have been rotating bicuspids just as soon as the two cusps are through the gum. It is not an easy matter to pinch a band on a bicuspid in such a condition, but I have obviated the necessity of pinching the band in such cases by having previously made up a number of plain bands, varying in size two-hundredths of an inch in circumference. These bands I have in stock and properly labeled, ranging from eighty-hundredths of an inch to one hundred and ten hundredths of an inch in circumference. When a case presents with a bicuspid, as described above, I select the size band I think will encircle the tooth. If, upon trial, it is found too small, a larger one is selected, and so on, until the correct size is obtained. In this way I find I can band such teeth without causing any pain, and it has also been found that a very few weeks of gentle force causes these teeth to rotate without any trouble at all, and also that two or three months' retention of teeth so rotated is sufficient. Two or three years of retention is not always sufficient when rotation is begun after root and bone are fully developed.

Degrees of Force in the Expansion Arch.

Before considering in detail the application of the expansion arch, it becomes necessary first to designate the degrees of lateral spring force applied to the anchor teeth through the expansion arch, so that an intelligent use of this force may be comprehended. This lateral spring pressure on the anchor teeth may be denoted as follows:

A—Denoting passive condition; *i.e.,* when in position the expansion arch exerts no lateral force.

AL—Denoting lingual force; *i.e.,* when in position, force is exerted lingually.

AB—Denoting buccal force; *i.e.,* when in position, slight force is exerted buccally.

AB2—Denoting greater buccal force than indicated by AB.

AB3—Denoting greatest buccal force.

Comparing the relative spring pressure of spring gold and German silver, the following caution should be observed:

Where spring gold is used for the construction of the expansion arches, and great haste is not desired, it is never necessary to put more expansion in an arch than is necessary to move the teeth the required distance. Where base metals are used in the construction of the arch, it often becomes necessary, at the beginning, to put more expansion in the arch than the distance it is expected to move the teeth.

Now, for the sake of simplicity and clearness of description, the application of the expansion arch will be considered under several headings corresponding to the various tooth movements necessary to accomplish, taking up first the simple labial movement of the incisors, and then various combinations of tooth movements found necessary in everyday practice.

1. To Move the Incisors Labially.

This can only be accomplished without carrying the anchor teeth buccally or lingually, by so placing the tubes on the anchor bands that they are parallel with each other. This necessitates a sharp bend (Fig. 12) in the expansion arch just in front of the nuts, in order that the arch may lie close to the cuspids and bicuspids, and not interfere with the soft tissues. The arch must be bent, so as to pass into the tubes without exerting any lateral spring, denoted Exp. A. When one end of such an arch is inserted into the tube on the anchor band, the other end should lie parallel, when passive, with the tube that is to receive it. The incisors to be carried forward are ligated to the arch, and as the nuts are turned up, this movement is accomplished.

If the incisors are inlocked, or the molars are not sufficiently fixed to resist such pressure without tipping distally, as sometimes happens in Class II, Division 2, it is advisable to solder hooks on the arch in front of the nuts, and from these use intermaxillary rubbers on each side to hook well forward on the lower expansion arch. In this way the molars can be left undisturbed, and they will be more useful as anchorage when shifting the lower teeth forward.

2. To Move the Incisors Labially, and the Cuspids, Bicuspids and Molars, Buccally.

In order to accomplish this, it is only necessary to so shape the expansion arch that when the labial and buccal surfaces of the teeth are brought in contact with it, they will have assumed the desired position, or the shape of the ideal dental arch.

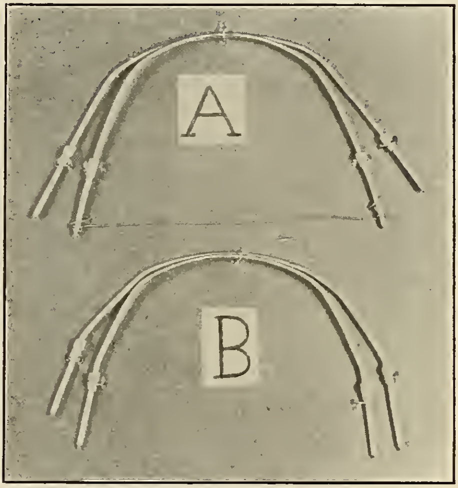


Fig. 12

This is so simple that it would seem impossible for anyone to meet with any difficulty, *but it is rare, indeed, for a beginner to properly adjust an arch for such a purpose.* The tubes on the anchor bands must be so placed that when one end of the expansion arch is inserted in the tube, the other end would, when passive, lie on the same plane, from both a vertical and horizontal view, with the tube which is to receive it. If the dental arch is to be lengthened to any extent, which is done as in No. 1, it will also cause expansion in the region of the anchor teeth. Failure to realize this fact is responsible for over-expansion in the molar region.

3. To Move the Incisors Lingually, and the Cuspids, Bicuspids and Molars, Buccally.

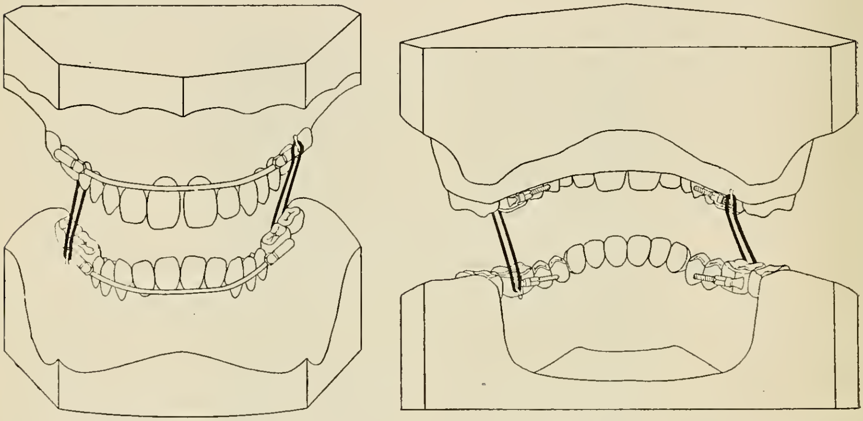
This movement is often required on the upper arch in the treatment of Class II, Division 1. The adjustment of the tubes on the anchor bands and the shaping of the expansion arch, should be the same as in No. 2, having Exp. AB2. On trial, on the model, it will be found, when passive, to stand some distance from the cuspids, bicuspids and molars. When this expansion arch is inserted, it should stand away from the cuspids and bicuspids, and should be ligated to these teeth first. If the arch is not too heavy (.038 inch is sufficient), it can be brought in contact with these teeth, and will be carried away from the incisors. The nuts should now be loosened, so that the arch may be forced back until in contact with the incisors. If any of these are to be rotated they should be properly ligated to the arch, otherwise no ligating of the incisors is necessary. As the cuspids, bicuspids and molars on each side are carried buccally by the spring of the arch, the incisors will be carried lingually. An expansion arch so applied is practically automatic, and may be allowed to go a month without attention. If nothing breaks, the worst that can happen is to carry the incisors too far lingually, and this can be readily counteracted by turning up the nuts on the arch. Note how the force is reciprocated from one side to the other, and also to the anterior teeth.

4. To Move the Cuspids, Bicuspids and Molars on One Side, Buccally.

Usually when such a movement is necessary in either dental arch the malposed teeth are inlocked by those of the opposing jaw. In order to overcome this inlocking without displacing the teeth on the opposite side, some precaution is necessary. It is obvious that it will not do to depend on the reciprocal force of the expansion arch, as in No. 3. The attachment to the teeth on the normal side should be as nearly stationary anchorage as possible.

This may be accomplished in various ways, but the one here described seems the most applicable. The cuspid on the normal side is fitted with a plain band, and a rigid wire is soldered from the end of the screw of the clamp band to the cuspid band. This necessitates care being used while cementing these bands in place, but the cuspid tooth being easy to fit, there will be little danger of the band coming loose. The buccal tube is so shaped that the expansion arch cannot rotate in it, and should be so placed on the band that the expansion arch will lie close to the bicuspids and cuspid on the normal side. The other end of the expansion arch should lie on the same plane, from both a vertical and horizontal view, when passive, with the buccal tube, which is to receive it, and should stand away the distance it is necessary to move the malposed molar buccally.

The arch is then inserted into the tube, with the nut so placed that the arch lies very close to the incisors. As the inlocked molar moves buccally, the nut on the arch on this side should be turned up from time to time, so that the arch does not press on the incisors. If this end of the arch should tend to slip forward out of the buccal tube, it can be prevented by the adjustment of a rubber ligature over the back end of the tube and over a small hook soldered on the arch in front of the nut. When the molar reaches its proper position the second bicuspid may be ligated to the arch, and so on, one at a time, until all the malposed teeth are brought into proper position. In this way, it will be seen that four teeth on the normal side, two of which must move bodily if they move at all, are pitted against the inlocked molar. Subsequently, this molar can be straightened up by the proper application of retaining appliances.


FRONT VIEW

REAR VIEW

Fig. 13

Further reinforcement of this anchorage can be obtained by the use of intermaxillary rubbers on each side (Fig. 13).

Fig. 14 shows profile views of a case requiring such application of appliances. Fig. 15 is a front view of the same.

5. To Move the Cuspids and Bicuspids Buccally on Each Side.

This can be accomplished without disturbing the other teeth, by so placing the buccal tubes, that when the expansion arch is inserted it will rest passively in them. The expansion arch should be of the shape and dimension that the dental arch is to assume. It will thus be found to be some distance from the malposed teeth. By use of silk ligatures these teeth can be caused to move buccally until they come in contact with the expansion arch. Or, if a light expansion arch is used, it may be ligated with wire, so as to rest in contact with the cuspids and bicuspids, and thus obviate interference with the soft tissues.

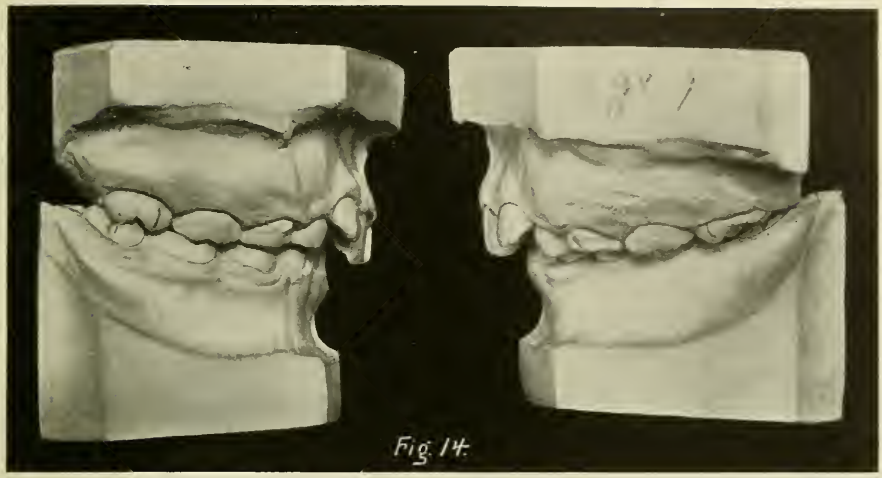


Fig. 14.

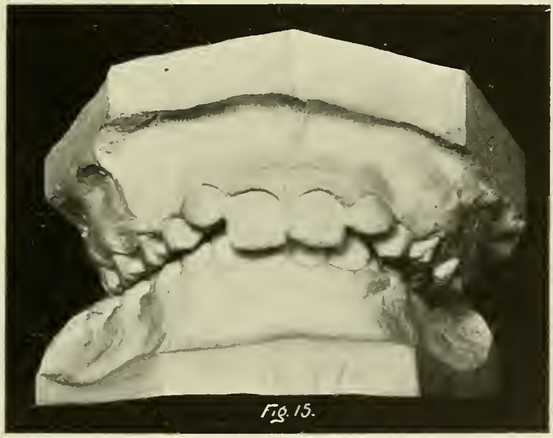


Fig. 15.

This necessitates the turning back of the nuts on the expansion arch, the front portion of which should be allowed to approximate the incisors As the malposed teeth move buccally, these nuts should be gradually turned up to prevent carrying the incisors lingually.

Obviously this would cause some temporary displacement of the anchor teeth. To prevent this, the expansion arch should have Exp. AB at the beginning, and when the cuspids and bicuspids begin to move, it should be reduced to Exp. A.

6. To Move the Incisors Lingually and the Cuspids and Bicuspids Buccally.

In order to do this without disturbing the anchor teeth, if for any good reason the first molars are to be used as anchorage, it is advisable to have a swivel attachment of the buccal tubes to the anchor bands, which will be described under the heading, "Rotating of Molars." The simple way to bring about such a movement is to use X bands on second bicuspids and treat as in No. 3.

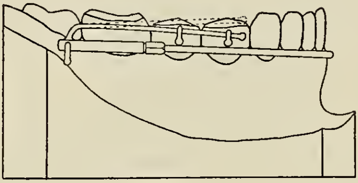


Fig. 16

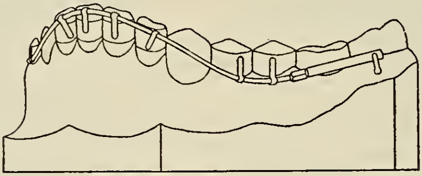


Fig. 17

7. To Elongate Bicuspids.

This can be accomplished by use of an auxiliary spring soldered well to the distal end of the buccal tube, allowing it to pass forward occlusally of the expansion arch. With the expansion arch in place, and properly ligated to the cuspids and incisors, this spring is ligated to the bicuspids in infra-occlusion. It is usually well to band these teeth so that the ligatures may be attached to proper hooks (Fig. 16). Fig. 17 shows application of a light arch, as described by Dr. Case, to accomplish these same tooth movements.

Fig. 18 shows profile and front view of a case requiring such treatment. Fig. 19 the same after treatment. Fig. 20 is the profile and front view of the face before treatment, and Fig. 21 the same views after treatment.

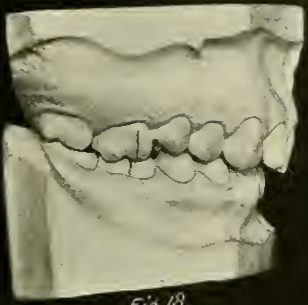


Fig. 18.

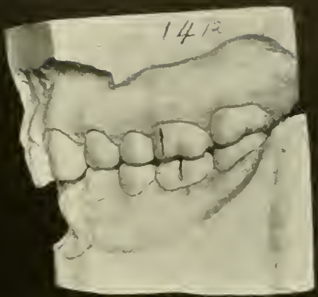


Fig. 18.

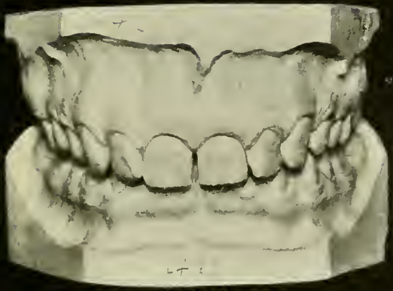


Fig. 18.

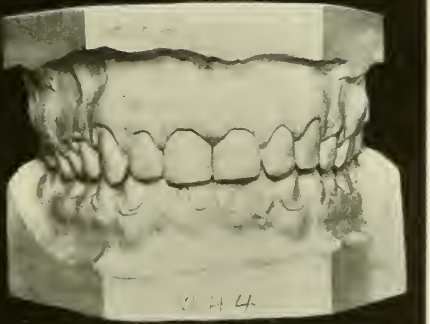


Fig. 19.

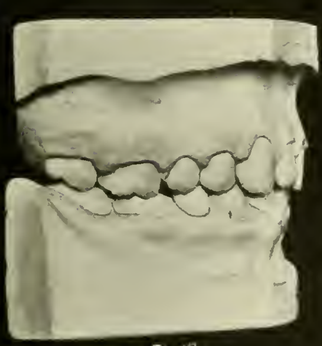


Fig. 19.

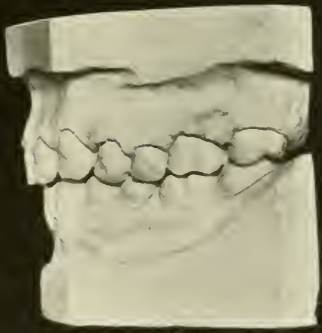
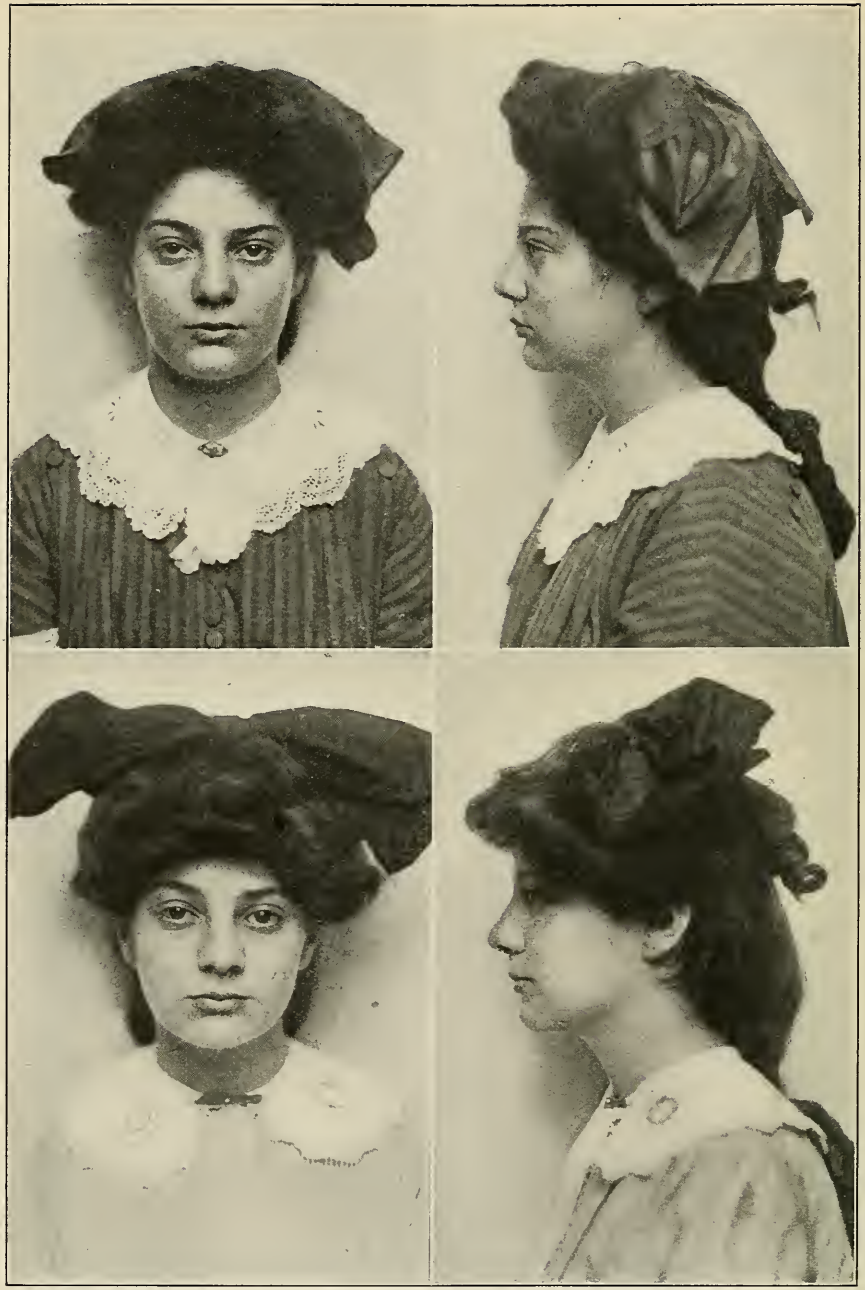


Fig. 19.



Figs. 20 and 21

8. To Elongate Anterior Teeth.

Infra-occlusion is found in various sections of the dental arch. In this connection infra-occlusion refers to teeth that are so placed that it is impossible for them to be brought in contact with the teeth of the opposing dental arch. The incisors are more often in infra-occlusion than the other teeth, and the upper incisors more often than the lower ones. Where both upper and lower anterior teeth require elongating, the application of intermaxillary rubbers is of great assistance.

The teeth to be acted on should be fitted with bands which have on their labial surfaces suitable spurs to engage the arch, so that it cannot be moved toward the incisal edges of the teeth when the mouth is open and the rubbers put on stretch. These rubbers should be applied in a triangular way. To accomplish this, spurs are soldered to the upper expansion arch in the region of the distal surface of the upper lateral incisors. These spurs point towards the gingiva. On the lower expansion arch spurs are also soldered pointing towards the gingiva, and may be placed directly under the upper spurs, or either mesial or distal to this point, as desired.

The arches are adjusted so that when passive they will rest just above the spurs on the anterior bands. If such an arch is sprung so as to rest below these spurs (*i.e.,* gingivally), the tendency will be to tip the molars mesially and elongate the anterior teeth. Sometimes it is advisable to have swivel attachments of the buccal tubes to the clamp bands and then, by use of intermaxillary rubbers, the molar tipping can be obviated.

Where the lack of vertical development is confined to the anterior teeth in one dental arch, the rubbers should not be worn. The tooth on each side most mesial, and not in infra-occlusion, should be banded and a wire soldered from it to the screw of the clamp band, as described in No. 4. This prevents forward tipping of the anchor teeth, and permits the expansion arch, which should be as light and elastic as possible, to spring from the front end of the buccal tube on each lateral half to the point where it engages the spur most distal. Owing to the length of spring thus obtained, the delicacy of adjustment is much greater and the efficiency increased.

9. To Rotate the Anchor Teeth Causing the Disto-buccal Corners to Move Buccally.

It is rare indeed to find the first molars, either upper or lower, requiring such a movement. When desired, it can easily be accomplished by so placing the buccal tubes on the anchor bands, that when one end of the expansion arch is inserted in the tube, the other end of the arch, instead of being on the same plane with the tube, from a vertical view, presents buccally towards its distal end. If both molars are to be equally rotated, the arch should be removed, and the end that was free in the first trial inserted in the tube on the opposite side.

The end that is now free should bear the same relation to the tube that is to receive it as the first one did. When the arch is inserted, it should stand away from the bicuspids on each side, and as the distal ends of the arch are caused to spring lingually they exert a constant outward pressure, and thus rotate the molars. If necessary, by ligating the arch to the bicuspids on each side, the pressure on the molars can be increased and the rotation hastened.

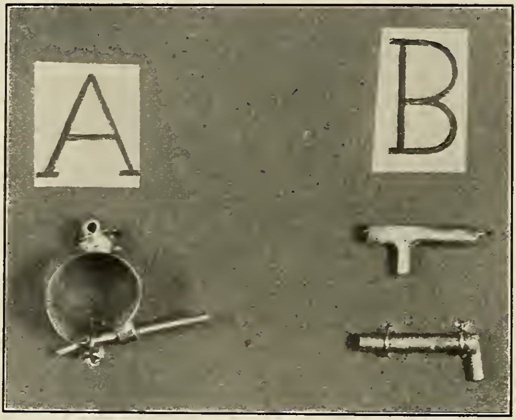


Fig. 22

10. To Rotate the Anchor Teeth Causing the Disto-buccal Corners to Move Lingually.

This movement is very often required in order to establish occlusion, and unlike No. 9, is often very difficult to accomplish. In young patients it can usually be done by putting a sharp bend in the expansion arch just in front of the nuts, causing the distal end of the arch to present lingually. (B Fig. 12.) An arch so shaped tends to work out of the tubes, and, if not ligated to the anterior teeth, it should be held in place by means of a rubber ligature on each side, as described in No. 4.

In older patients, and especially where the tooth mesial to the molar to be rotated has been lost, other means must be resorted to. The D band, with the screw directed distally, is fitted to the molar to be rotated. It is then removed, the buccal tube unsoldered, and to this band is soldered a suitable round tube in such position as to lie over the mesio-buccal corner of the tooth, and be parallel with its long axis when the band is cemented and clamped in place (Fig. 22a). To the buccal tube is soldered a suitable wire in the desired position (Fig. 22b), in such relation that when it is passed into the tube on the band the buccal tube will assume the proper position to receive the expansion arch, giving a hinge attachment between the arch and the band.

Where the tooth mesial to the molar to be rotated is missing, as in Fig. 23, a suitable hook can be soldered to the expansion arch in such a position that a rubber ligature can pass from the screw on the molar band to this hook without exerting pressure on the tooth in front of the space. If this arrangement is used on each side it will be observed that we have established reciprocal force to rotate these teeth, and it is doubtful if any tooth can resist this constant pull of rubber.

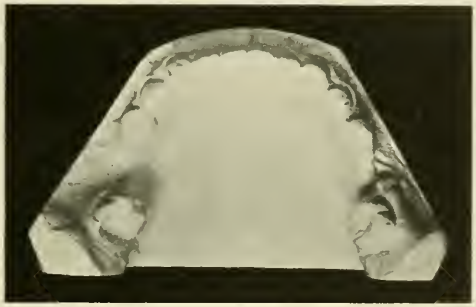


Fig. 23

Where no tooth is missing, a suitable wire of spring gold can be soldered to the molar band in such a position as to present lingually as it passes forward in the bicuspid region. This may now be ligated to the expansion arch, and caused to lie in contact with the bicuspids. From time to time, as the ligature is renewed, this lever may be bent lingually before the new ligature is applied.

11. To Move the Upper Incisors Lingually.

The adjustment of the buccal tubes and the expansion arch should be the same as in No. 1, except that the sharp bends in the arch should be some distance forward of the nuts. Owing to the fact that teeth move forward so much more easily than they move backward, it becomes necessary to resort either to occipital or intermaxillary anchorage. If the latter is employed, the lower expansion arch should be adjusted in such a manner as to establish, as nearly as possible, stationary anchorage. This will be described later.

12. To Move Molars and Bicuspids Lingually.

While this movement is not often required, it has been considered difficult to accomplish, but this is not so, if the spring of the expansion arch is combined with the constant pull of rubber. A stiff arch should be employed, and should be so shaped that in order for it to be inserted into the buccal tubes it must be sprung buccally. Such an arch will always tend to move forward, unless ligated to the anterior teeth. To do this is a mistake, unless the incisors are to be moved labially or rotated. The expansion arch should be held in place, *i.e.,* so as to press against the buccal surfaces of bicuspids, by rubber ligatures, one on either side, passing from suitable hooks attached to the expansion arch over the distal ends of the buccal tubes.

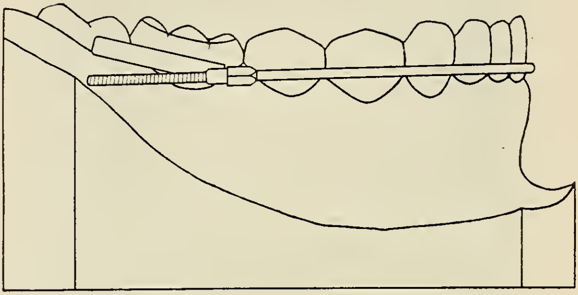


Fig. 24

If it is desirable to move these teeth bodily, it can be done by using the elliptical tube on the anchor band, and a plain band on the first bicuspid, uniting the two by soldering a piece of stiff wire from one to the other on the lingual side, as described in No. 4. If this is done on either side, and the arch inserted and worn long enough, the teeth will be carried bodily lingually.

13. To Straighten up Molars Tipped Mesially.

If but one molar is tipped, the tube on the anchor band for the normal side should be placed in the usual way. The other should be so attached to the anchor band that when the expansion arch is inserted in the tube on the normal side, the other end of the expansion arch should be on the same plane with the tube that is to receive it, *from a vertical view,* but from a horizontal view the mesial end of this tube should present toward the gingiva (Fig. 24). If this arch is now sprung in place the tendency will be to tip mesially the normal molar, and at the same time straighten up the tipped molar. Owing to the difficulty of depressing teeth in their sockets, the normal molar scarcely moves at all, and the tipped one is made to assume its normal position. Fig. 25 shows a case requiring such treatment.

When a molar on each side of the same dental arch is tipped the tubes should be placed so that when the arch is inserted the front portion will lie, when passive, at least one-eighth of an inch below the gingival border (Fig. 26). This arch should then be sprung to the proper position and firmly ligated to the cuspids and incisors. This will tend to tip the molars back, and at the same time depress the anterior teeth. The latter movement will be so slight, however, that it will not be noticeable, and as soon as the pressure is removed they will readily return to their former positions.

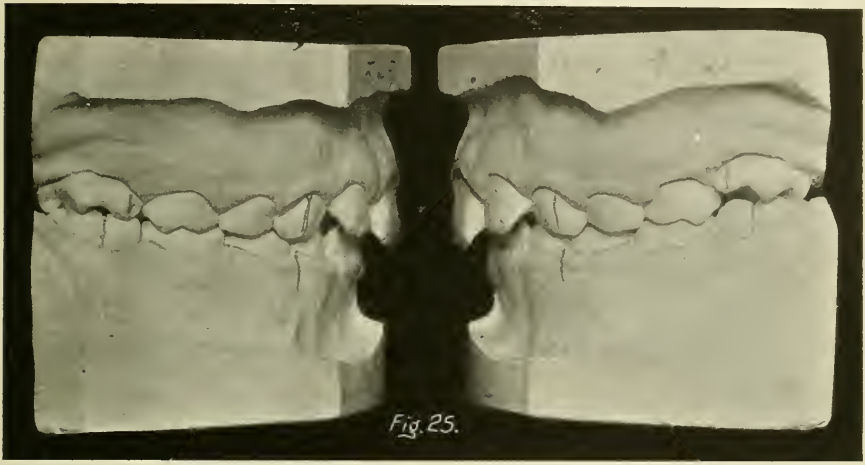


Fig. 25.

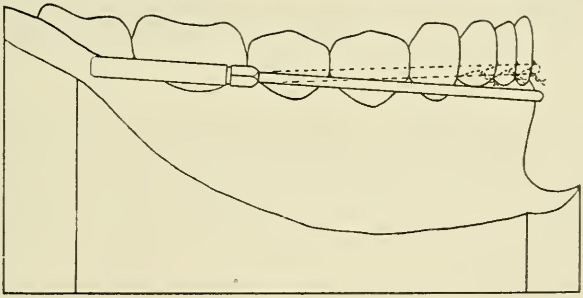


Fig. 26

This manner of adjustment is also used to create stationary anchorage on the lower dental arch where desired, but in such cases the expansion arch, when inserted into the tubes, should lie, when passive, closer to the gingival border of the anterior teeth than where it is desired to tip the lower molars distally.

14. The Adjustment of the Arches and the Application of Intermaxillary Rubbers in the Treatment of Class II, Division 1.

It is always advisable to have both expansion arches in place when intermaxillary force is to be applied. Two methods may be employed, according to the movement required.

Where it is thought advisable to tip the molars distally, so as to place the inclined planes of these teeth in harmony with the molars on the opposing jaw, the expansion arch is adjusted in such a manner that as these teeth are tipped distally they will be in proper relation mesio-distally with the lowers.

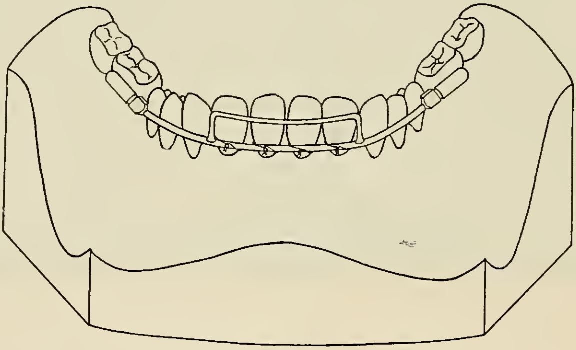


Fig. 27

The upper arch should have suitable hooks, so placed that when the arch is inserted they will be on a line with the distal surface of the upper laterals. Over these, rubber ligatures are passed to the distal end of the buccal tubes on the lower D bands. One rubber on each side is sufficient at the beginning, and if more force is required later the number of rubbers may be increased.

As the molars tip distally, the arch will require lengthening by turning up the nuts, so as to keep the front portion of the arch free from the incisor teeth. It will also be found necessary either to readjust the tubes on the anchor bands, or to put a bend in the arch on either side, so that the front section will be in proper position on the anterior teeth, which is at the gingival border. The lower arch is adjusted, as previously described, to create stationary anchorage.

This method of treatment depends very largely on efficient retention of the molars to carry the lower teeth forward as they gradually assume their upright positions.

The other method is to bring about a mesial movement of the lower teeth, without tipping the upper molars distally. To do this the upper expansion arch should be adjusted as in No. 3. The lower expansion arch may be used as has been described, or one or more of the front teeth may be ligated to the arch and moved forward, by turning up the nuts on the arch, then, according to the case, two or more teeth may be ligated, and so on, until all the lower teeth are carried forward to their normal positions.

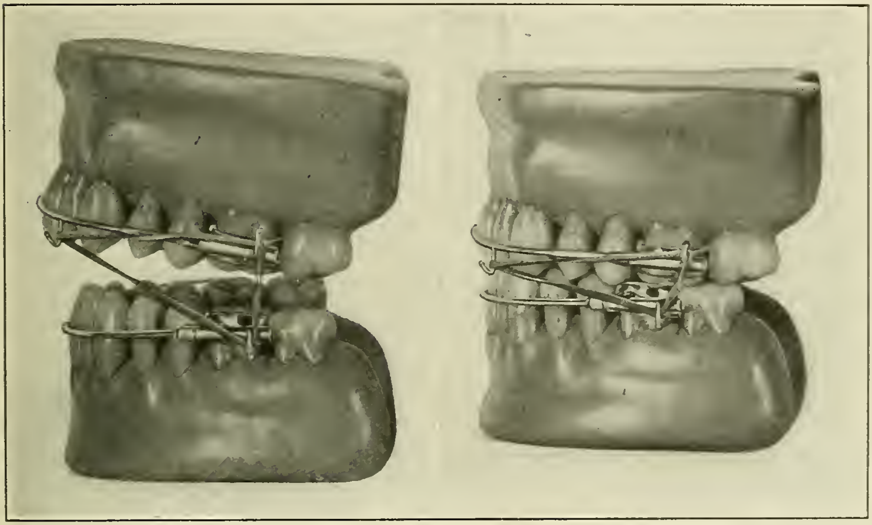


Fig. 28

An auxiliary wire soldered to the front portion of the lower expansion arch, so as to engage the labial surface of the incisors and cuspids, close to the incisal edge, has been found of value to prevent tipping of these teeth in their forward movement (Fig. 27). This wire should be of spring metal, and not over .030 of an inch in diameter, so that it may be occasionally bent in such a manner that the arch will stand away from the labial surface on the incisors and cuspids, when the auxiliary wire is in contact with the teeth.

In the treatment of a sub-division of the First Division of Class II, the intermaxillary rubber should be worn on but one side, and may be adjusted according to either method just given for the treatment of the full division.

15. The Adjustment of the Arches and the Application of Intermaxillary Rubbers in the Treatment of Class II, Division 2.

As these cases usually require that the lower bicuspids and molars be elevated, it becomes necessary to use a bite plane of some description, so as to prevent the back teeth from meeting when the jaws are closed.

As in No. 14, two methods may be employed, but the distal tipping of the upper molars in this case is far less indicated than in the treatment of the Division 1. It is preferable to use intermaxillary force, as stated in No. 1, to move the upper incisors forward, and later reverse the application of the intermaxillary elastic so as to carry the lower teeth forward, and at the same time elevate the bicuspids and molars.

This can be done by soldering suitable hooks on the upper buccal tubes, so that the intermaxillary rubbers can be applied in a triangular shape; *i.e.,* to pass from the hook on the arch in the lateral region to the hook on the buccal tube on the upper, and then over the distal end of the buccal tube on the lower on each side (Fig. 28). If necessary to increase the intermaxillary force, a second rubber may be employed on each side, but in the usual way; *i.e.,* from the hook on the upper arch over the distal end of the buccal tube on the lower. When two rubber ligatures are worn in this way, the one from the lower to the upper should be put on first. If this is not done the rubber ligature, worn in the triangular shape, is very liable to break.

The next six figures show a case of this kind treated as described above. Fig. 29 shows profile and front view of models of the case before treatment; Fig. 30, occlusal view of same; Fig. 31, profile and front view when retention was applied; Fig. 32, occlusal view of models at this time; Fig. 33, profile and front view of face before treatment, and Fig. 34, same view after treatment.

In the treatment of a sub-division of this class, it is only necessary to apply the rubbers on the side that is abnormal.

16. The Adjustment of the Arches and the Application of Intermaxillary Rubbers in the Treatment of Class III.

In order to prevent, as much as possible, in these cases the labial tipping of the upper anterior teeth in moving them forward, an auxiliary wire should be soldered to the front portion of the arch, as described in No. 14. In pronounced cases of this class it will sometimes be necessary to elongate the anterior teeth as they are carried forward.

The application of the lower arch should be such as to embrace, as nearly as possible, all the lower teeth as a unit of anchorage, but it is impossible to establish stationary anchorage to the same degree as where intermaxillary force is applied in the opposite direction.

To accomplish this the lower cuspids are banded, and to these is soldered a labial wire. On this labial wire are soldered four small U-shaped pieces, made from iridio-platinum round wire .022 of an inch in

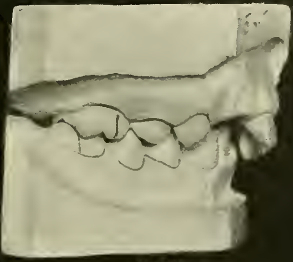


Fig.29.

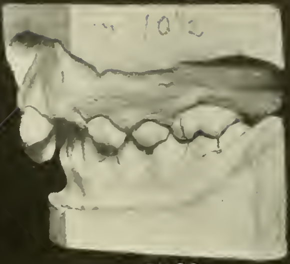


Fig.29.

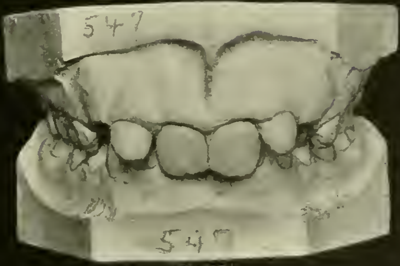


Fig.29.

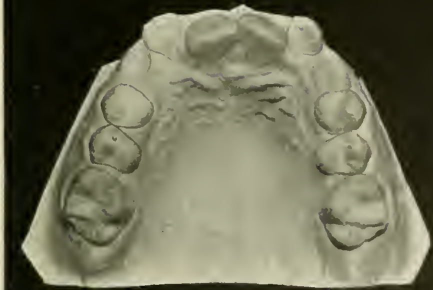


Fig 30

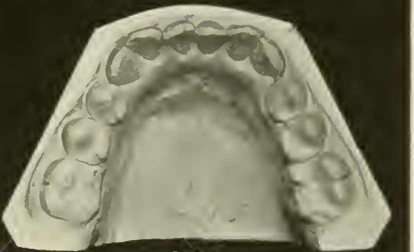


Fig.30

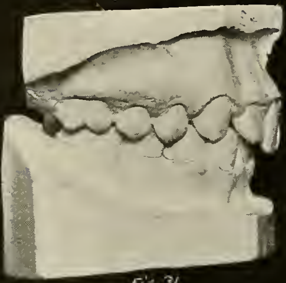


Fig. 31.

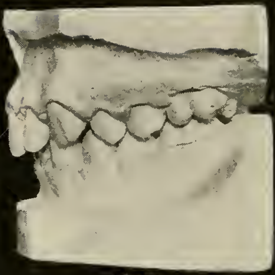


Fig. 31.

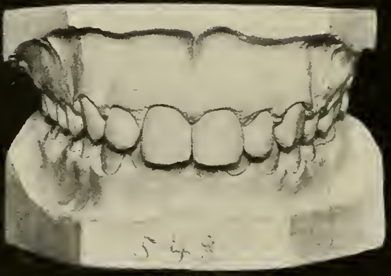


Fig. 31.

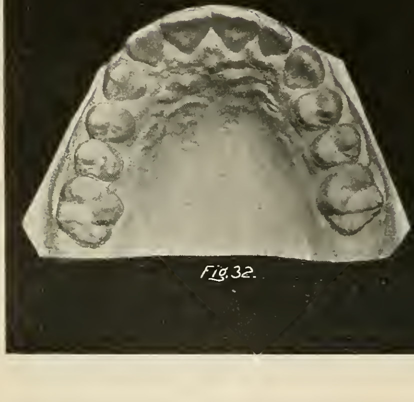


Fig. 32.

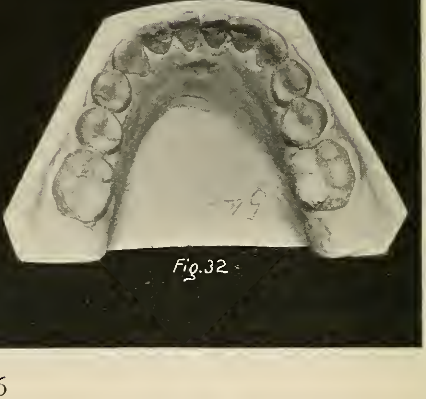
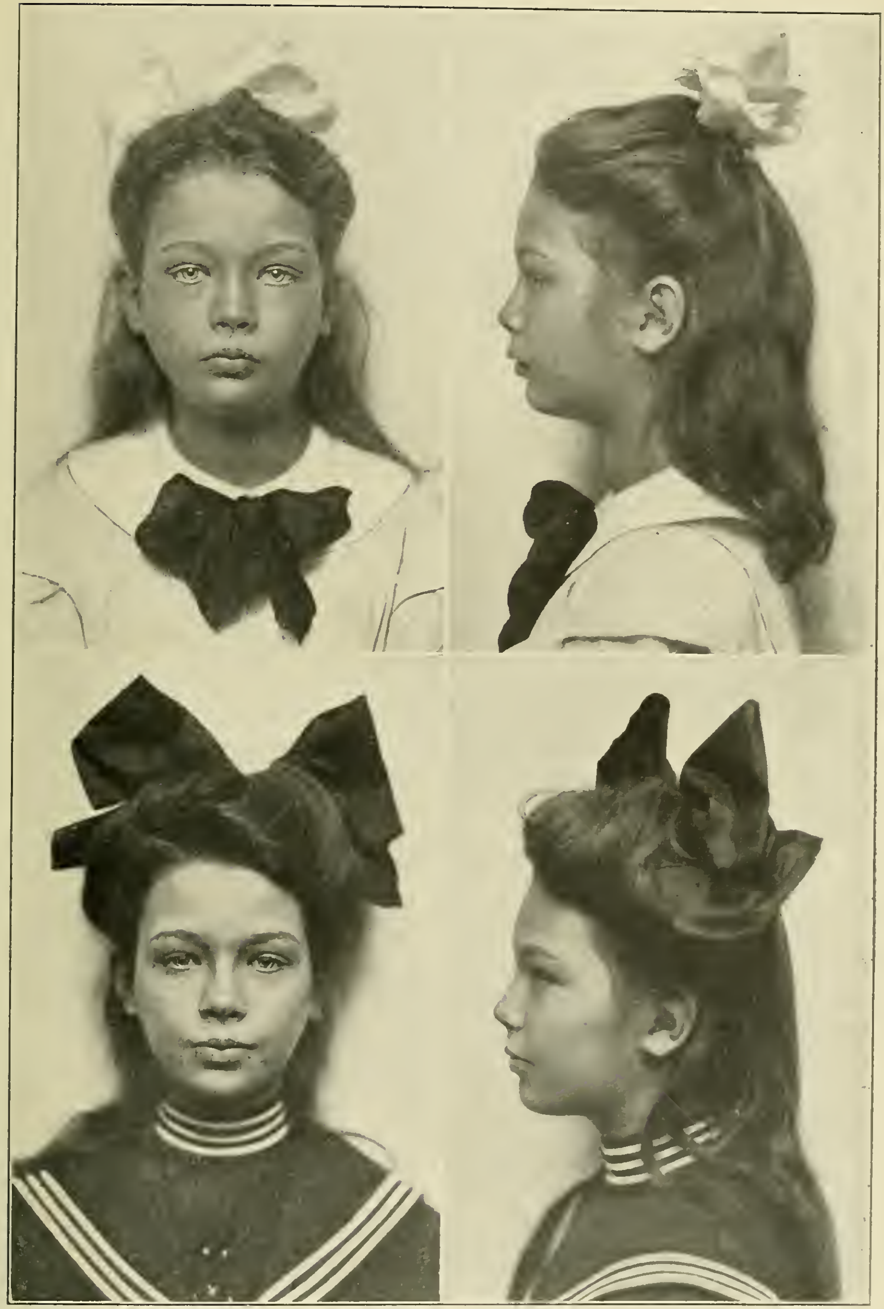


Fig. 32



Figs. 33 and 34

diameter, so as to engage each of the lower incisors on the labial surface just under the free margin of the gum. On the lingual side of each cuspid band is soldered a short, round tube, the bore of which is .036 of an inch. To the lingual screw on each molar band is soldered an iridio-platinum wire to pass forward, and so bent as to fit in the tube on the cuspid band on each side, and should enter this tube from the gingival aspect.

The expansion arch is now adjusted with Exp. A, so as to rest as nearly as possible in contact with the teeth, and securely ligated to them. In this way very little tipping of the molars can take place.

Discussion of Dr. Young's Paper.

Dr. H. A. Pullen. After listening to this splendid essay on the technic of efficient application of fixed appliances, and noting the completeness of detail, the clearness of description, and the perfect order and arrangement of the several divisions of the subject, I feel that a commendatory and congratulatory word should first be given to the essayist for his valuable contribution to the literature of orthodontia technic before attempting to make any other comment.

This essay, on account of its being the most complete systematic description of the correct methods of using the expansion arch for various tooth movements, from the simplest to the most complex, stands unique in orthodontic literature. It is one of these "missing links," as it were, which are occasionally found in every science, which exactly fit into the place that has apparently been left for some one who had the knowledge and inspiration to produce it.

The value of this article may be comparatively estimated when it can be shown that the various authors on orthodontia technic for the last twenty years have failed to give us such a perfect description of the application of the expansion arch as is given in this essay.

Again, a glance at the archives of orthodontia, as shown by our text-books, will reveal a certain bareness in spots; not perhaps noticeable to the careless observer, but all too evident to the astute reviewer, and perchance, even to the authors themselves, who, by the subtlety of their art, have cleverly concealed their otherwise palpably evident omission of such important technical descriptions as this essay supplies.

Likewise, the simplest description of primary principles in any science is always the most desirable, from the reader's standpoint, because it is the easiest for his mind to grasp, as compared to a complex, verbose, disunited description of such principles. This essay is written so simply that any one can understand it, and the clearness, conciseness, and completeness of the text is a credit to the essayist and a joy to the reader. As an evidence of its clearness, it may be noted that the paper can be read and understood perfectly without a single illustration.

Relative more particularly to the point of view taken by the writer in this essay, it is most appropriate for him to deal with his subject from the standpoint of efficiency, in view of the many inefficient applications of the appliances for the correction of malocclusion that are daily made by those who do not understand what efficiency means as regards appliances in the mouth.

For example, the various tooth movements described in the essay necessarily require that the relations of force and anchorage be always correctly proportioned, and the expansion arch so adjusted that its force will be just sufficient to do the work required of it, and at all times be under the control of the operator, and the exactness with which the essayist describes the positive control of both force and anchorage is the most important feature of the paper to which I wish especially to call your attention.

Efficiency is the keynote to the various combinations described under the different headings in the essay, and in consequence of the subject being treated from this standpoint, the particular value of the paper, in whole or part, to the student or practitioner is inestimable.

Relative to the positions, the shaping and manipulation of the expansion arches for the various tooth movements described, I add a hearty approval, for in each instance force and anchorage are so proportioned and conserved that successful results in treatment thereby must be assured.

Taking up the technical discussion of the subject relative to these principles, there are certain features spoken of by the essayist which cannot be too strongly impressed.

For example, the principle of fixation of the appliances upon the teeth, so that the patient cannot remove them, is one of the secrets of the success of the modern orthodontist.

The cemented clamp band, or plain band, illustrates most perfectly the fixation principle in the anchorage; and the expansion arch, firmly supported by the buccal tubes, and by ligatures, represents this same principle in the operating appliance.

Whatever the esthetic requirements may indicate in the way of bands without projecting screws and nuts on the lingual side, the clamp band, perfected by Dr. Angle, will always stand foremost in its power of holding to the tooth, and consequently, will always produce the greatest power of fixation in the anchor tooth.

As regards the fixation of the expansion arch upon the anchor teeth, it will be observed that the inexperienced operator will use an expansion arch which can be bolted to the distal end of the buccal tube rather than take chances with an expansion arch which is free to slip out if the ligature comes off.

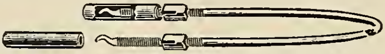


Fig. 1.

It has happened with experienced operators, that, relying too much on the gripping power of the friction sleeve, and the anterior ligatures, occasionally a patient will come in with the expansion arch sealed up in an envelope instead of being secure in its proper place upon the teeth.

It speaks well for the gripping power of the friction sleeve that this accident is only occasional, and it is not my intention to discredit this valuable device in mentioning a further means of holding the arch in place in the buccal tubes than that afforded by the friction sleeve and ligatures. I refer to a short curved spring (Fig. 1) ground upon the end of the expansion arch with the carborundum wheel, this spring being shaped somewhat like a vulcanite scraper, such as you were familiar with in the early days before the electric lathe came into general use.

This "beaver-tail" spring may be made to exert any degree of internal spring upon the inside of the buccal tube, thus ensuring that the expansion arch will not slip out of the tubes if the anterior ligatures come off, and also that the patient cannot remove the arch without using considerable force.

Of quite as much importance as the fixation of the expansion arch is the means whereby the nut on the arch is prevented from unturning during mastication, and in the friction sleeve nut we have an example of reciprocity between two otherwise independent parts of the mechanism.

The friction sleeve prevents the arch from slipping out of the buccal tube, and the flange of the nut tightening against the friction sleeve prevents the nut from unturning.

Of a somewhat different structure, but answering the same purpose, is the split nut, also shown in Figure 1. This nut is pinched together in the split portion, and then turned on the arch to its proper position, which it will positively keep, except when turned with a wrench.

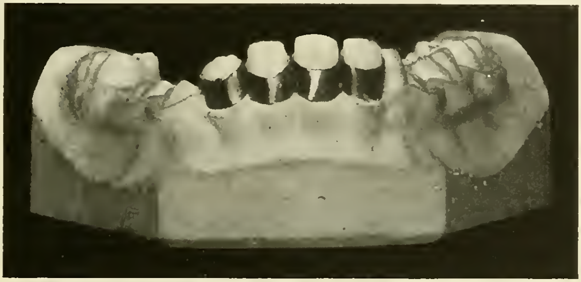


Fig. 2.

These details of structure are seemingly trivial, and yet, if they are not taken into account, the efficiency of the appliance is never up to a proper standard, as those have reason to know, who, in their experience have had the plain nuts on the expansion arch unturn, the ligatures become loose, and the arch slip out of the tubes.

For the purpose of protecting the tooth surfaces most prone to injury from the formation of food retention centers, where the expansion arch touches the teeth, in the region of the lower incisors especially, it is sometimes a good plan to cover these incisors with delicate bands of thin gold and platinum.

As shown in Figure 2, the bands are contoured close to the gum line and soldered on the lingual surface. An alloy of twenty parts pure gold, with about four parts of platinum, is very pliable and easy to fit around these teeth, and is sufficiently strong to answer every purpose.

In reference to the clamp bands, I have a preference for the lapping band, because of its more perfectly protecting the tooth when cemented in position. The surface upon which the lingual screw rests, even if cement is placed between the screw and the tooth, is liable to become more or less of a retention center for food, and the lingual lap covers this otherwise open space and thoroughly protects the tooth surface in this region.

In the movement of molars lingually or buccally on one side only, I have occasionally used the intermaxillary elastic from the lingual side of the upper molar on the normal half to the lingual surface of the lower molar on the half in buccal occlusion, as shown in Figure 3. By this means a greater force is obtained than in the method shown by Dr. Young, where the elastic is stretched from the buccal side of a lower molar to the lingual side of an upper molar, directly antagonizing with it on the same lateral half. Also, the direction of the force is more nearly correct, and the interference with the tongue is trivial.

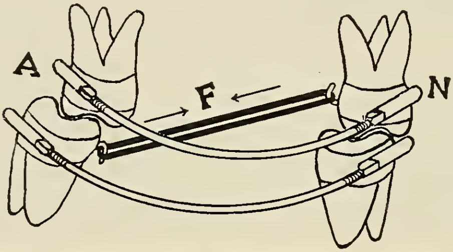


Fig. 3.

Dr. Ottolengui. I wish to thank Dr. Young for his paper. Just as Dr. Pullen did, I read this paper without the illustrations, and, considering the variety and number of problems discussed, I thought it remarkable that it should be so clear that, with careful reading, it was possible to understand the somewhat complex technic even without his illustrations.

There was, however, just one point throughout the paper which once in a while was not clear, and that brings me to a subject that we might very well as a society clear up at once. I allude to the term "arch." The essayist endeavored to differentiate between the metallic arch and the dental arch by always using the word "expansion" when alluding to the appliance, but it just happened in one place that he left out the word "expansion," and for the moment it was a little confusing.

Even the use of the adjective "expansion" is not quite sufficiently accurate, because the essayist himself in this very paper shows us how we can *contract* arches with this *expansion* arch. If Dr. Lischer will permit me to mention it, I would say that in his forthcoming book he has used the words, "alignment wire." I think that we should abandon this word "arch," and adopt another term for the appliance. Some writers have used the word "bow." During Dr. Pullen's discussion he spoke of the arch slipping; if he had said "the bow slipped" we would have known at once what he meant, but when saying "the arch slipped," it might be difficult for a beginner to know which he meant. I think it might be well for us to use the word "bow" instead of "arch." If we must always say "metallic arch," that is objectionable, being two words instead of one; and the same is true of Dr. Lischer's suggestion "alignment wire."

I agree with Dr. Young practically in everything that he has said. I believe, also, as Dr. Pullen has said, that the paper fills a long-felt want, and I shall only allude to one or two points.

In one place, in the early part of the paper, the essayist speaks of separating teeth with wire, and then goes on to say that in adult cases the silk ligature may be used. I believe that the silk ligature should be used almost always. I believe that in correcting malocclusion we should cause as little pain as possible. There are two ways of applying force in the mouth: in one we exert the greatest force against the greatest resistance. If we do this we cause the greatest amount of pain. If we twist a wire ligature around the contact point we at once apply the maximum of force that the patient is able to endure at that moment; that is what I mean by exerting the greatest pressure against the greatest resistance; that will cause pain.

If we pass a silk ligature around the contact points and tie it tight, we exert the least force against the greatest resistance. As the ligature begins to contract, it does so gradually, and we have an increasing stress upon a decreasing resistance, and that gives the least pain.

Painless Application of Ligatures.

Dr. Rogers, in his president's address, told us of the remarkable tenacity with which we adhere to habits. I fear that we often get into certain habits of procedure, and fail to look for better ways of doing what seem to be simple things. We have all experienced the difficulty of passing wires between teeth, especially at the outset of treatment, and our little patients have experienced the pain. The utilization of the silk ligature in place of the wire still left us with troubles on our hands. The end of the silk cannot be passed between the teeth below the contact point, because it lacks the rigidity of the wire, yet it is rigid enough to cause distress if forced down from the incisal edges, towards and past the points of contact. It was not till some time after I had been using the heavy silk ligatures for separating teeth, that it occurred to me that a similar method of introducing all ligatures would save much pain to my little patients. Now, in all cases where the teeth are in close contact, I loop a strand of soft floss silk, pass a looped end of the ligature silk through the loop of the floss, and as the floss is readily and painlessly passed from the incisal edges, down and past the points of contact, the looped end of the ligature silk is then easily drawn through under the contact points, producing the minimum of distress for the patient. This requires more time, as it necessitates the looping of each end of the ligature, but it makes a friend of the boy or girl.

I wish to express my approval of, and gratitude for, the band fitting instruments shown by Dr. Young. I find them so useful that I felt like dismissing an assistant who broke the one which Dr. Young first presented to me, until I learned that Dr. Young had a fresh supply. I at once secured two, and keep one in reserve.

The essayist has given us many valuable directions as to how the tubes should be attached to the molar bands in order to produce the greatest efficiency from the very inauguration of the treatment. He pointed out the important influence that will be exerted by these tubes, in accordance with the planes in which they lie, and the relation they may bear one with the other, and both with the occlusal plane of the natural teeth. But he did not explain to us the methods by which he secures this accuracy of adjustment. There is a hint in his paper, from which I deduce that he makes these adjustments working directly in the mouth. I believe, too, that this is the usual mode of procedure. I must confess that I am unable to accomplish my purpose in this way. I always aim to so attach the tubes to the molar bands, that when the bands are cemented to place, and the bow introduced, the bow will lie exactly in the plane desired, standing off from the buccal teeth neither more nor less than it should at the outset of the work, and exerting neither expansive nor contractive force. In other words, the bow, when first introduced, should be in a state of rest, while lying in the plane and position demanded by the plan of treatment. I find that I can accomplish this with greater certainty working to a model.

Technique of Adjusting Bands and Tubes.

Having fitted the molar bands, without tubes, of course, as described by Dr. Young, and the child having worn them for a sufficient time to get accustomed to their presence, I take an impression of, let us say, the upper arch, with the bands on the molars, and while the lingual nuts are screwed up tightly. This is important, because if the bands are loose upon the molars at the time of taking the impression, the tightening up of the nuts when finally cementing the bands in place will deflect the tubes.

After taking the impression, the bands are removed and set in their proper places in the impression. Silk ligatures may then be tied between the teeth, and the patient dismissed until the following day. A preferable plan, however, is to fit a second pair of bands and dismiss the child with these in position. This not only preserves the spaces between the teeth, but these bands may then be put aside and used later in retention.

The impression is filled with a mixture, one-half sump and one-half plaster, though any of the soldering investment compositions may be used for making the model. When separated, we have a model of the mouth with the molar bands in place. With a sharp knife cut away the buccal half of each molar. This is done to permit the flame of the blow-pipe to reach the band from the lingual aspect, thus avoiding the danger of overheating and burning the tube. (See Fig. 4.) A tube is placed over one end of the bow and held against the buccal side of the molar band, thus determining the exact position which it should occupy. It is then fastened to the molar band with hard wax, and the bow withdrawn.

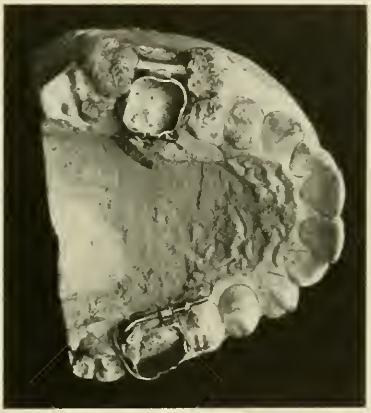


Fig. 4.

At this point I must mention a most useful compound, the formula of which was first given to me by Dr. Young, and which is as follows:

Asbestos fibre	1 pound
Coarse pumice	2 pounds
Potter's clay	5 pounds

These are mixed with water and kneaded into a doughy mass, which is kept in a glass preserve jar. If inclined to flake, use less of the clay. The jar being kept tightly stoppered prevents the drying up of the composition, though water may be added at any time. For want of a better name, I shall call this composition "investment putty."

The first tube having been attached to the band with wax, a very small mass of the investment putty is placed over each end of the tube and pressed against the model, to which it will be found to adhere slightly. It is well also to place another mass of the investment putty over the lingual screw and nut, as a precaution against inadvertently melting the nut, and thus ruining the appliance. A buccal tube thus attached to the band and ready for soldering is shown in Figure 4. Unlike other investments, the blow-pipe flame may be thrown upon this investment putty, which at once hardens into a brick-like mass, without sputtering or displacement. I consider this composition indispensable in the orthodontist's laboratory, and indeed it would be useful in prosthodontic work also.

The tube is readily soldered, and the bow may be again introduced and its direction studied. It is then altered by bending until the opposite end with its tube rests "dead" against the molar band of the opposite side, the bow itself occupying exactly the position and relations demanded by the treatment of the case. The second tube is then waxed to place, and the bow should be readily withdrawn without disturbing the second tube, which is only attached with wax; otherwise the bow is not properly set, and probably has some spring. The second tube is soldered, as was the first, and when these molar bands are cemented in the mouth, the bow will enter the tubes and occupy exactly the relations worked out on the model.

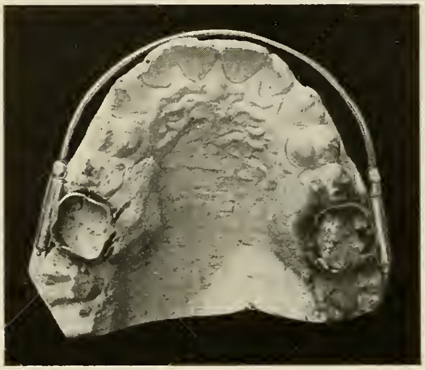


Fig. 5.

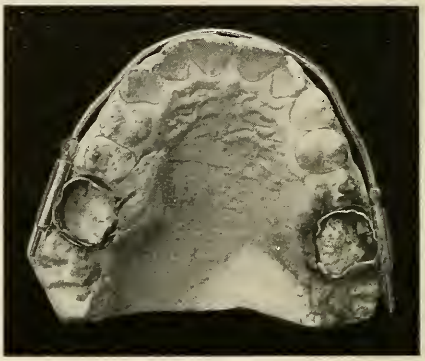


Fig 6.

It might seem that this is a lengthy process, but except for the time lost through waiting for plaster to set, the technic is exceedingly simple. For example, I have frequently set and soldered two tubes in this manner, while waiting for cement to harden in the mouth of another patient. Nor is it actually necessary to have a day elapse between taking the impression and placing the appliance in the mouth. If the patient can wait an hour, the work can all be done at one sitting. It is my preference, however, to make two sittings of the work, because I can then allow time for the model to set hard.

Adjustment of the Bow.

Dr. Young, in this paper and in previous papers, alludes to bending the bow near the ends in order to avoid the danger of rotating molars during expansion. In very narrow, or V-shaped arches, the bending of the bow in this form often causes the bow to stand off so far from the bicuspids and molars as to cause serious irritation of the cheeks. Whilst we can seldom, if ever, have the buccal tubes actually parallel, we should have them as nearly so as possible, and in doing this we would often find the bow assuming the relation shown in Figure 5. If a bow of sufficiently small gauge is used, so that it is possible to tie the bow tight to the bicuspids at once, too great a force would be exerted against these teeth, and in moving buccally they would be badly tipped. This difficulty may be obviated, and the work greatly facilitated by making a double bend in the bow, as shown in Figure 6. This is a method which I find has been used by others, but as I have never seen it advocated in print, I offer it for the benefit of those who may not have thought of this solution of a somewhat vexing problem.

If the illustration (Figure 6) be studied, it will be seen that the buccal tubes are fairly parallel, while the bow stands away from the bicuspids sufficiently for the inauguration of the treatment. When the teeth have been moved buccally, so that they touch the bow, the bow can be readily altered without removing and resoldering the tubes. To accomplish this, first slightly compress the bend in the bow nearest to its entrance in the tube. Place the bow in the tube, in the mouth, and the bow will stand away from all the teeth. Then compress the second bend, and this will cause the bow to come back into proper relation with the front of the arch, while standing slightly away from the bicuspids. The bends on the opposite side are then altered until that end of the bow will lie against the buccal tube (not in it), and perfectly parallel with it. The bow may then be slipped into both tubes, and the widening of the bicuspid region resumed, there being no expansion force in the molar region.

There is one more point that I would like to speak of. The keynote of this paper is efficiency. I think that the efficiency of the molar clamp bands would be greatly increased if the screw be attached near one edge of the band rather than at the center, as is commonly the case. This, of course, interferes with the universal application of the clamp band, but that is not to be considered. It is merely necessary to have two styles of bands, right and left bands, one might say, as seen in Figure 7, A. With bands made in this manner a "right band" would be applicable to the right side, whether the molar be an upper or a lower. Figure 7, B.

With the band as made at present, the screw attached at the center, we often meet trouble on both the upper molar and the lower. Upper molars not infrequently are so tapering from the middle third of the tooth to the occlusal surface that the tightening of the nut on the screw actually drives the band off the tooth, whereas if the screw were attached at one edge of the band, and applied so as to lie close to the gum, the band could readily be tightened. Likewise with the screw in this position, viz., close to the gum margin, it is less likely to irritate the tongue. (Fig. 7.) Conversely the lower molars frequently tip lingually to such an extent that the screw should be attached at the edge of the band nearest to the occlusal surface to avoid irritation of both tongue and soft tissues. Thus a "right band" made in this way solves both problems on the right side, and, of course, "left bands" are equally effective on the left side. (Fig. 7.)

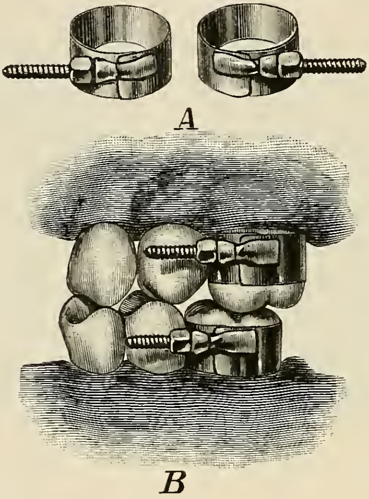


FIG. 7.

This idea is not original with myself. Indeed, I have heard the theory often expounded by others, but so far I have not heard anyone report practical experience with bands made after this manner. Therefore, I may state that I have had Mr. Aderer make up all my bands during the past year in this style, and from my experience I can say that I firmly believe that the right and left bands here illustrated are far more effective, being more readily adapted in difficult cases, and being much less likely to become loosened or dislodged than the old style band with screw attached at the center of the band.

Dr. Lischer. Inasmuch as Dr. Ottolengui has referred to my forthcoming work, and the desirability for a more suitable term for our so-called "expansion arch," I feel I owe you an explanation. I have discarded it for *alignment wire* first, because we use the appliance for *contraction* of the dental arch as well as for *expansion;* second, we should limit the word *arch* to the teeth, viz., the dental arch. And third, if we trace the evolution of this element of an appliance we find that it has passed through many stages. In its earliest forms it was made of wood, or strips of bamboo. Later it was used in the form of a flat ribbon of metal, either plain, perforated, or corrugated. Still later it assumed the form of a D-shaped wire; and finally, that of a round wire, either with plain or threaded ends. And though its uses have been greatly extended in recent years, its primary purpose is for the establishment of arch form, for placing the teeth of the arch to which it is applied into *alignment.* Hence we may very appropriately term it *alignment wire,* especially since it is invariably made of wire.

I regret to note that Dr. Young did not refer to Körbitz's recent work upon the subject of which his paper treats; the more so, since the latter's work was so thorough and so richly illustrated.

Dr. Rogers. I will ask Dr. Young to close the discussion of his paper.

Dr. Young. Really I have nothing more to say; all I can do is to thank the gentlemen for the very kind remarks, and to thank you all for the reception accorded to my paper.

A Consideration of Certain Types of Dento-Facial Deformity.

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Professor of Orthodontics and Oral Surgery, Dental Dept., Marquette University,
Milwaukee, Wisconsin.

Literature and research in orthodontics during the last decade have undergone such wonderful transformation that it would seem to many that there is little left for consideration and debate. In these days of scientific investigation we are prone to think that each succeeding decade has settled the larger problems of research, not only for itself, but for all future time.

"We are the heirs of all the ages; after us, the deluge," is a saying that can be attributed to many really great men. It is related that as Daniel Webster was closing the term of his long and distinguished public service, Charles Sumner was just entering upon a public career equally long, and, if possible, more distinguished. In congratulating Mr. Sumner upon his election to Congress, the venerable Webster said: "Sumner, you have come too late; all the great public questions have been settled." Yet Sumner, as we know, was a participant in the consideration of questions so momentous that Webster and his colleagues shrank from seriously discussing them.

I confidentially believe, however, that for the research student there still remains much to be accomplished, especially as regards an intelligent understanding of the etiology, diagnosis, treatment and prognosis of certain types of dento-facial deformity.

Our present method of diagnosis, wherein the occlusal inclined planes alone guide us, seems to me inadequate for the orthodontic specialist. I do not wish to infer that Angle's classification has not served a good purpose in the past, for it gave to the orthodontist a splendid opportunity to broaden his views for further investigation and study. But it has its limitations; it is not sufficiently comprehensive, and is sorely in need of an improved terminology.

According to Angle's classification, a diagnosis need only embrace abnormal relation of the dental arches and malposition of the teeth. It is obvious that this method is too limited for the specialist who desires to correct deformities which extend beyond the confines of abnormal position of the inclined planes. While occlusion must always be recognized as a fundamental postulate in the correction of malocclusion, it can only serve as an aid, but not as an absolutely sure guide for the diagnosis of all dento-facial deformities.

I have often been asked, "Can a satisfactory diagnosis be made of all forms of malocclusion by using the above classification for a basis from which to work?" My observations compel me to answer in the negative.

Since Angle's classification of malocclusion was introduced into the profession, a number of writers have attempted to devise improvements, or to recommend a more suitable method of orthodontic diagnosis. But the only proposal thus far advocated, which is sufficiently comprehensive, is Lischer's, whose modification of the Angle classification is a real improvement, and particularly in its terminology.

Lischer recognizes three conditions, each reducible to elementary divisions, regardless of their manifold combinations. These are: (1) Malformation of the Jaws and their Processes; (2) Malrelation of the Dental Arches; (3) Malposition of the Teeth.

Malformation of the Jaws.

1. *Macrognathism*—over-development.
2. *Micrognathism*—arrested development.

Prefixes:

a. Mandibular or lower.
b. Maxillary or upper.
c. Bimaxillary—when both jaws are similarly affected.

Suffix:

"Gnathia"—meaning jaw.

Malrelation of the Arches.

1. *Distoclusion*—distal relation of lower.
   Unilateral—one side only.
   Bilateral—both sides.

2. *Mesioclusion*—mesial relation of lower.
    Unilateral—one side only.
    Bilateral—both sides.
3. *Neutroclusion*—in neither direction.
    Neutral relation of lower to upper.
        (Angle's class 1)

The ending *clusion* from the Latin *claudere-clausum* to close.

Malposition of the Teeth.

1. Labioversion—Labial to normal.
2. Linguoversion—Lingual to normal.
3. Buccoversion—Buccal to normal.
4. Distoversion—Distal to normal.
5. Mesioversion—Mesial to normal.
6. Torsoversion—Rotation.
7. Supraversion—Elongation.
8. Infraversion—Shortening.
9. Perversion—For impacted teeth.
10. Transversion—For transposed teeth.

The ending *version* from the Latin *vertere*—to turn, to change position.

This method of classifying the malrelation of the dental arches and malposition of the teeth is very applicable in making a differential diagnosis, as far as it concerns the orthodontist. But *Malformations of the Jaws,* subdivided only as over-development and under-development, does not cover all deformities. For instance, Blair divides jaw deformities into six classes: Class 1, Normal lower jaw protruding forward. Class 2, The body of the lower jaw relatively retracted. Class 3, The anterior part of the lower jaw protruding on account of abnormal length apparently in the bicuspid region. Class 4, The upper or the lower jaw deficient, on account of lack of certain teeth in either. Class 5, The two molars in occlusion; the anterior teeth fail to occlude by increasing distances, due to a bending downward in the body of the mandible. Class 6, Deformities resulting from abnormal extraneous forces, such as the contraction of scars; spasms of paralysis of the muscles other than those of mastication. You will notice that this division is applicable to the lower jaw only. Careful observation of such deformities of the lower jaw has convinced me that the mandible is more frequently in malposition than actually deformed. I am also satisfied that many distocclusions, or so-called Class 2 cases, are not a distal shifting of the lower arch, but a distal shifting of the mandible carrying the lower arch backwards.

This phenomenon is easily produced during the period when the glenoid fossa is being formed. Careful observation and dissection of a number of fœtuses and infants have satisfied me that this fossa is exceedingly shallow in infancy, and develops in depth and size simultaneously with the eruption of the teeth.

At this time I am unable to furnish exact facts pertaining to the development of the temporo-mandibular articulation. I hope to have a complete report after another season's dissection. However, it is evident to me that a malposition of the mandible, especially distal shifting of this bone, is common during the age of dental growth, when the glenoid fossa is shallow.

Distal Malposition of Mandible.

As a result of my clinical examination of abnormalities, where I have found the lower arch distal to normal, the upper arch narrow, with the anterior teeth in labioversion, I became convinced that, by expanding the upper arch and reducing the slight protrusion of the upper anterior teeth sufficiently to occlude mesio-distally with the teeth of the mandible, providing the patient voluntarily brings the lower jaw forward, I could obtain a correct relation of the teeth and improve the facial lines. I have also found, after much experience in the treatment of these cases, that when I attempted to correct the abnormalities after the patients had reached the age when the teeth had all erupted, and after the alveolar process and the jaws had developed, and the muscles had become stronger and more set, the treatment, notwithstanding the use of modern retainers, would, in most cases, prove futile. If these cases of abnormality had been treated during the time when the dental area was developing, then there would have been no tendency of the teeth to assume their original deformed position.

Treatment of cases in which the dental area was already developed was invariably unsucessful, while on the other hand opportune care during the age of dental growth proved successful in every case.

I question the possibility of orthodontists to successfully correct distal malrelation of the mandible after the development of the glenoid fossa. The shifting of the lower dental arch mesially in such cases no doubt can be accomplished, thereby obtaining normal occlusion. Such results, of course, may satisfy the operator, but to me it seems to be nothing short of pseudo-orthodontia. I am confident that the relation of the dental arch to the lower jaw is usually normal. I believe that the lower first molar will usually erupt in a normal position, and, should it occlude distally, it is usually due to the distal malposition of the mandible.

The etiology of distal malposition of the mandible can usually be traced to some form of nasal stenosis, forcing oral respiration. Thus we find the mouth more or less open, the tongue occupying an abnormal position. This position will sooner or later change the mechanical action of the depressor agents of the mandible, namely: first, the platysma myoides muscle; second, the digastric muscle; third, the mylohyoid muscle, and fourth, the geniohyoid muscle These muscles, assisted by gravity, that is, the weight of the jaw, keep the mouth open, while the anterior segment of the temporal muscle, the masseter muscle and the internal pterigoid muscle antagonize the depressors of the mandible. This abnormal action of these opposing muscles will be influential in changing the development and position of the mandible.

This condition can only be brought about during the period of tooth eruption. The damaging results of nasal stenosis can bring on a number of complications involving the growth and development of the dental area. Strange as it may seem, the general practitioner, as well as a large number of rhinologists, labor under the impression that the correction of nasal stenosis is all that is necessary to bring about nasal breathing, paying no attention to the normal development of the mouth, jaws and face, complicated by malocclusion.

I recall having had a patient report at my office, accompanied by her parents, who informed me that six months before, the little girl had had her adenoids removed by the family rhinologist. He informed them that after the adenoids were gone she would be able to breathe normally, and that it was not necessary to come for further treatment. The removal of the adenoids failed to give the little girl any relief, as she continued to breathe through her mouth. I carefully examined her, and found that the lower jaw was distal to normal, the arches then being in distocclusion, the lower lip beginning to rest against the lingual surface of the upper anterior teeth.

There can be no question but that this abnormality was a secondary condition arising from a pathological manifestation producing nasal stenosis. I could not understand why this little girl should continue to breathe through her mouth after her adenoids were removed. I doubted the results of the operation, and proceeded to make a careful digital examination, and I was astonished to find that the adenoids were still there. I suggested another operation permitting me to remove this mass of tissue. The patient was anesthetized under chloroform, and the entire mass was removed. One week later the patient was placed under orthodontic treatment. and she is now developing along correct anatomical lines.

The discovery of this attempted adonectomy urged me to more frequently investigate the results that were obtained in my patients who have had their adenoids removed. Much to my regret, I was astonished to find that there are in the medical profession pseudo-rhinologists who would be far better off following a plow behind a lonely mule. When rhinological progress equals that of orthodontics, then, and only then, can we expect a hearty co-operation in the development of the nasal and dental area.

Nasal Stenosis.

I do not wish to infer that dento-facial deformities and malocclusion are always due to adenoids, but I believe that occlusion of the nasal passages, be it partial or complete, will usually produce an arrested development of the maxillary bone, sometimes complicated by a distal shifting of the mandible. Patients, inheriting long, narrow faces, with high, thin noses, orbital cavities, accessory sinuses and nasal chamber very small, have alveolar processes limited in size, and the teeth in malposition. The nasal pharynx being small, it is but natural that such patients are liable to suffer considerably from nasal stenosis, produced by inflammation and other pathological conditions. The smallest portion of pharyngeal tonsil may produce complete stenosis. Such patients are usually a type developed from ancestors who have suffered for centuries from the effect of nasal stenosis and oral respiration. In other words, it may be assumed that disuse of the nose and mouth breathing for generations past, produces a facial characteristic called leptoprosopia, a type we commonly call an adenoid face. Patients having a large nasal pharynx never suffer to the same degree from stenosis as do patients having narrow faces. Although adenoids and other pathological conditions may be found in these subjects, they usually remain unnoticed, because they have plenty of room to breathe through the nose, and so, suffer very little inconvenience. These patients will go on developing along anatomical lines, the teeth erupting normally and the jaws functionating properly.

Lowering of Palate Not Possible.

In recent years there has been much discussion and much space has been given to the articles in dental and medical journals pertaining to the lowering of the palate by widening the upper arch, so as to increase the space of the nasal channels for the correction of mouth breathing. Many believe, however, that by mechanical force the two maxillary bones can be separated at their suture line, and that this kind of treatment would allow a deflected nasal septum to drop between the suture. Others have believed that by widening the upper arch, the palate would be lowered, permitting the septum to become straight. In the minds of students in research work pertaining to the embryological and anatomical development of the mouth, jaws and face, this has been questioned, and considered a subject of much speculation and debate.

In my own practice of eight years of orthodontic work, I have proven to my own satisfaction that it is an anatomical impossibility to lower the palate by widening the arches, or to separate the maxillary bone at the suture line after the developmental period. While a casual comparison of the dental arches and palate of carefully constructed models, made before and after treatment, would lead one to believe that the depth of the palate is less in the after-treatment case, careful measurements prove the contrary. It is but natural that a narrow dental arch, especially if it has excessive alveolar processes, would make the palate look deep and narrow; and that after careful widening of the upper arch by proper orthodontic treatment, it would seem that the palate were lower. This, however, I find not to be the case. What is accomplished is a reconstructed arch, wider and more symmetrical, which gives the appearance of bounding a shallower palate. In order that you may better understand me, let us take, for example, an ordinary drinking glass. The depth of the drinking glass, according to its width in comparison, appears to be excessive, but suppose it were possible, by some mechanical process, to enlarge the circumference of that glass to four or five times its size; the result would be a vessel which would resemble a soup bowl. Considerable study and work on abnormally shaped septa as to the etiology, prognosis and treatment, convince me that it is not possible, especially after the developmental period, to correct a malformed septum by radically expanding the upper arch, nor do I believe that it is possible to overcome mouth breathing by radically expanding the upper arch, regardless of occlusion, for the purpose of supposedly enlarging the nasal channels.

In an examination of fifty cases of mouth breathers, where the upper arches were more or less contracted, and the anterior teeth protruding, or crowded, I found only seven cases where the septum was deflected. In each case the patient gave the history of traumatism. In these fifty cases of contracted arches, I found forty-two cases of distocclusion and one neutroclusion. In other words, the lower jaw in forty-two patients out of fifty were distal to normal, thereby giving the patient a stupid, vacant expression. This deformity prevented the patient from closing the mouth normally without effort. This abnormal condition, you can see, will be a factor in the patient's continuing to respire through the mouth and, of course, the nose thus fails in its purpose to functionate. Unquestionably these abnormalities of distal shifting of the mandible are secondary conditions arising from a pathological condition producing nasal stenosis.

Here I wish to emphasize the fact that when once there is an abnormality of this kind produced, the rhinologist cannot hope to remedy it by correcting nasal stenosis, but will need the assistance of the orthodontist to carry on the work in changing the mouth deformity, so that the patient will be able to close the mouth naturally and without any conscious effort, thereby permitting the nose to functionate and develop accordingly. Let me caution you that even though the purpose be to improve the nasal passages, radical expansion of the upper arch, regardless of occlusion, is dangerous. It will fail in its purpose. Why? Because in trying to remedy one evil, we create another. Such radical procedure sacrifices the function of the teeth by establishing an inharmonious relation of the dental arches. I doubt very much the possibility of gaining space in the nasal channels by such radical procedure.

When we consider the development of the nares taking place simultaneously with the growth of the maxillary bone, I cannot but feel that orthodontists should widen the arches by a slow technical treatment. In other words, it should be in the form of a carefully trained physiological growth. Day by day, week by week, month after month, and without pain to the patient, the orthodontist should grow each and every tooth into correct anatomical relation with its antagonist in order to give the patient teeth which will enable him to triturate and masticate his food for its introduction into the alimentary canal. The teeth of the upper and lower jaw will then have the power to functionate normally, and, in consequence, the muscles of mastication, by the proper activity, will supply the amount of lymph and blood to the parts requisite for their development. Thus, from the increase of nourishment sent there, the maxillary and adjacent bones may be properly developed. We can then readily understand how the nasal chambers become wider as the nose resumes its function of development. The orthodontist should grow the maxillary bones where nature fails in proper tooth movement. I do not wish to infer that narrow nasal chambers can always be widened by orthodontic treatment; but I do know that where the pathological condition of the nose hinders nature in developing the nasal and oral areas, it is frequently possible at the proper age to stimulate normal development of the nose, jaws and face by orthodontic treatment.

A discussion of mandibular deformities I purposely omit in this paper, as I feel that the subject has been well taken care of by such men as Blair, Ballin, Babcock, and others.

Malocclusion and Cleft Palate.

I wish, however, to call your attention to the importance of early surgical correction in cases where malocclusion of the teeth is complicated by a congenital deformity characterized by a cleft involving a part or all of the hard and soft palate. Alveolar cleft is congenital, and is a serious condition which confronts the oral surgeon and orthodontist.

The defect varies in different subjects. In the more severe forms of cleft palate, a cleft continues from the tip of the uvula to the anterior palatine canal. It then bifurcates to communicate with a double alveolar cleft, permitting the forward displacements of the central portions of the intermaxilla or *os incisivum.* German writers usually call this form of deformity "Wolfsrachen" or "Wolf's Jaw." The displacement of the central portion of the intermaxilla always produces a pronounced deformity, which is complicated by a double cleft of the lip. The correction of this deformity can be accomplished only by surgery. Operators in the past would remove the entire central portion of the intermaxilla for the purpose of overcoming the excessive protrusion. This is rarely necessary now, as the technique in surgery has been so much improved that it is now possible at an early age to force the central portion into its normal position, thereby preserving some, if not all, of the four incisors. The result of such an operation I find in my practice has a tendency to deflect the normal eruption of the incisors, necessitating further treatment by orthodontic methods.

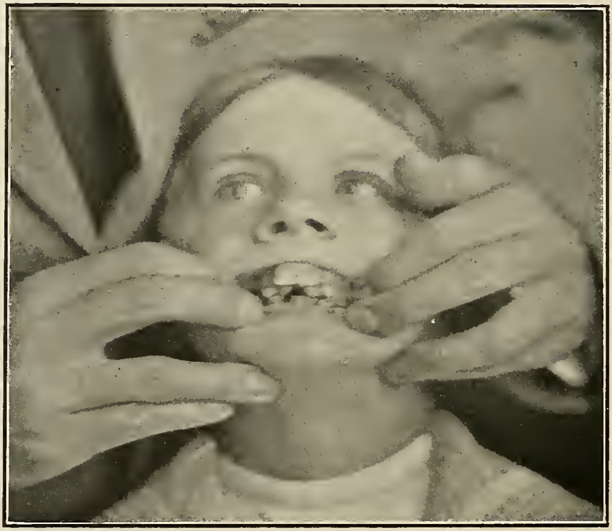


Fig. 1

A single alveolar cleft always produces malocclusion of the teeth. The cleft is usually found on the left side in the region of the upper lateral. This deformity, though not as pronounced as a double alveolar cleft, can only be remedied by surgical procedure.

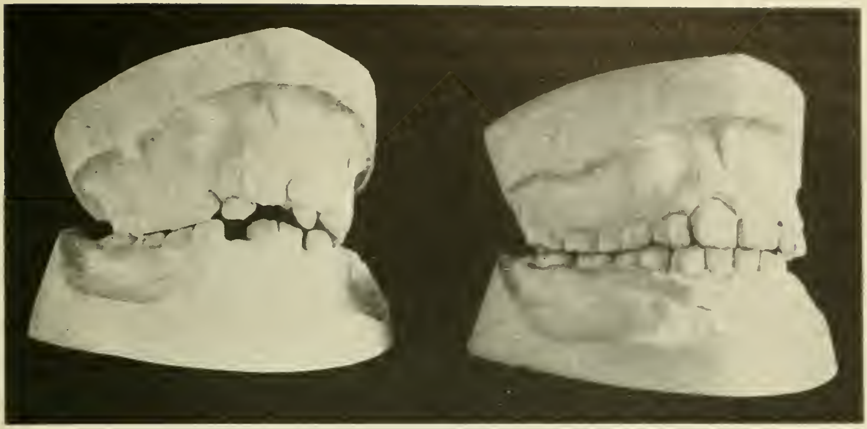


Fig. 2

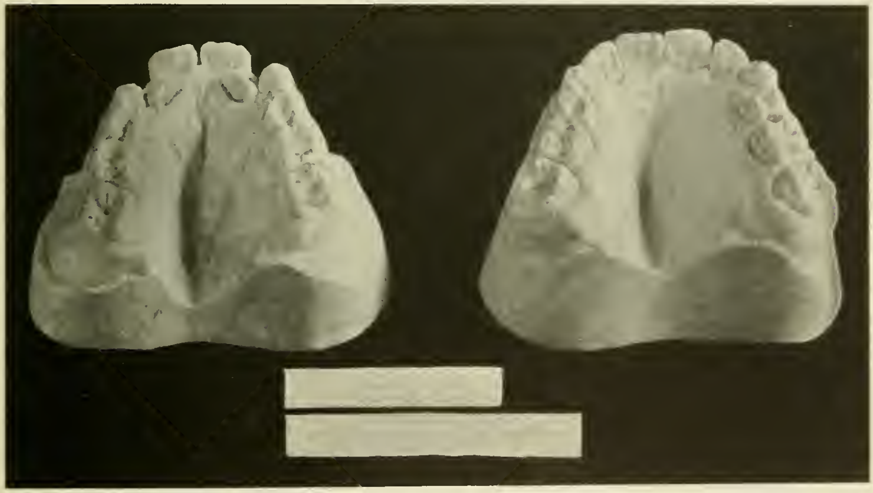


Fig. 3

The treatment of these cases by some operators is to forcibly close the cleft by pressure at an age when the bones will yield, which is usually any time within eight weeks after birth. This method of treatment in the hands of the inexperienced will usually produce a complicated condition; by that I mean that the tendency is for one side of the alveolar process to override the other, producing a buckling of the anterior portion of the alveolar process. While I must admit that such procedure of forcible contraction will close the cleft, I have abandoned this method of cleft palate operation, as I endeavor always to maintain the shape of the upper dental arch. I, therefore, in my operations for the closure of a complete cleft palate, always close the alveolar cleft first. This can be accomplished by forcible pressure, providing the patient is young enough, so that the borders of the cleft will be placed in contact. Should I find it impossible to bend the alveolar process, I usually produce a green-stick fracture, thereby preserving the shape of the arch. At a subsequent operation I then produce the muco-periosteal flaps and close the cleft of the soft and hard palate.

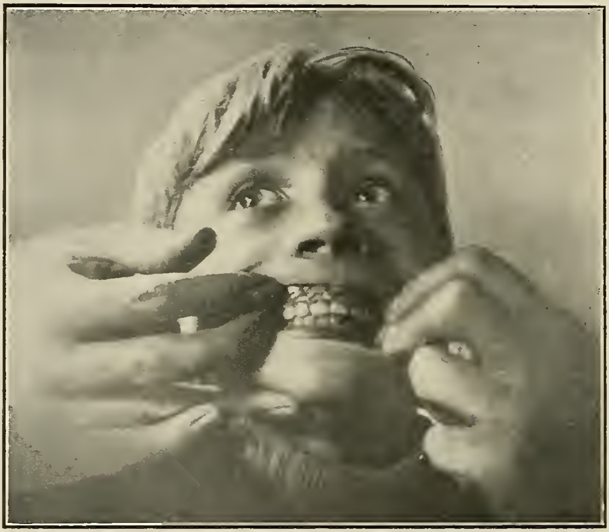


Fig. 4

Summary of Cases.

Case 1. Fig. 1. Shows the photograph of a boy who had been operated upon for the removal of adenoids and tonsils, but continued to breathe through his mouth.

Fig. 2. Shows casts of the teeth of this boy before and after orthodontic treatment. In this case it was necessary to reconstruct the upper arch, making it wider and more symmetrical. The lower jaw was shifted mesially, so that the relation of the inclined planes is correct.

The next picture, Fig. 3, shows the palatal view of the casts of the same case. Notice the strips of paper which illustrate the amount of space gained by widening the upper arch. Measurements prove that the palate was not lowered, but there was considerable widening of the nares brought on by growth.

The next picture, Fig. 4, is a photograph of the same boy one year after treatment. Notice the normal relation of his teeth, permitting him to close his mouth without effort. The nose being developed simultaneously with the growth of the jaws, he can breathe through his nose freely.

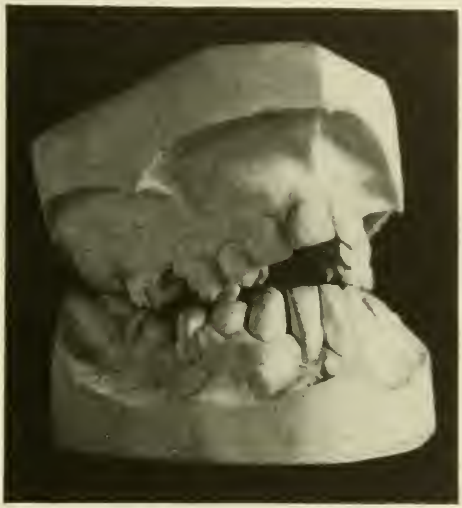


Fig. 5

Case 2.

Fig. 5 shows the casts of a pronounced malocclusion of the teeth, due largely to receiving improper treatment when under the care of dentists and rhinologists. The upper and lower first molars were extracted when the patient was a mere child. The upper left lateral and right cuspid were also extracted because the dentist at that time believed that the boy had too many teeth in his mouth on account of the crowded condition.

The patient, anxious to have a normal mouth, consulted another dentist, who informed him that it would be advisable to have the four lower incisors extracted. He, too, believed that there were too many teeth in the arch on account of the crowded condition of the boy's teeth. The lower incisors were then extracted, and a bridge (containing two large centrals with crowns on the cuspids) was fitted to take the place of the lost teeth. As the patient grew older he realized his inability to masticate his food properly, and he also found it very difficult to breathe through the nose. He consulted a rhinologist, who advised him that he could effect a cure if he would permit him to perform an operation. To this the boy consented, and he was operated upon for partial removal of the lower turbinates, adenoids, etc., together with a complete removal of the contents of his pocketbook, and again the young man failed to be relieved.

The next picture, Fig. 6, shows a photograph of the patient. Notice that it is an effort for him to close the lips. The nose has failed to develop on account of the maxillary bones being retarded in their development. Had this young man received the proper treatment during the period of tooth eruption and growth, by an up-to-date orthodontist and rhinologist, he would then have had a normal relation of his teeth, which would have enabled him to masticate properly, thereby stimulating enough lymph and blood to the adjacent parts for proper growth. This young man at the present time is under my care. Both upper arches have been considerably enlarged, and he is beginning to breathe better.

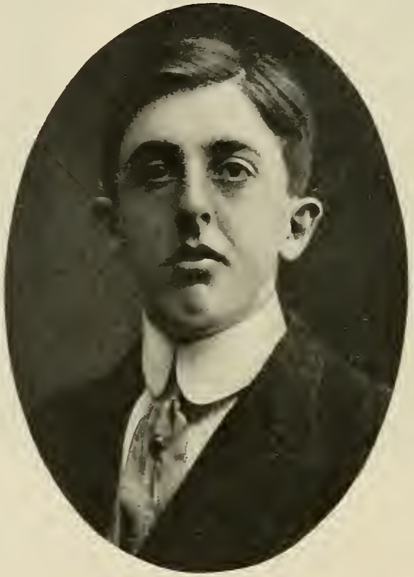


Fig. 6

Case 3. Fig. 7a shows the teeth of a dental student attending Marquette University. When I first examined this young man I found that he was a mouth

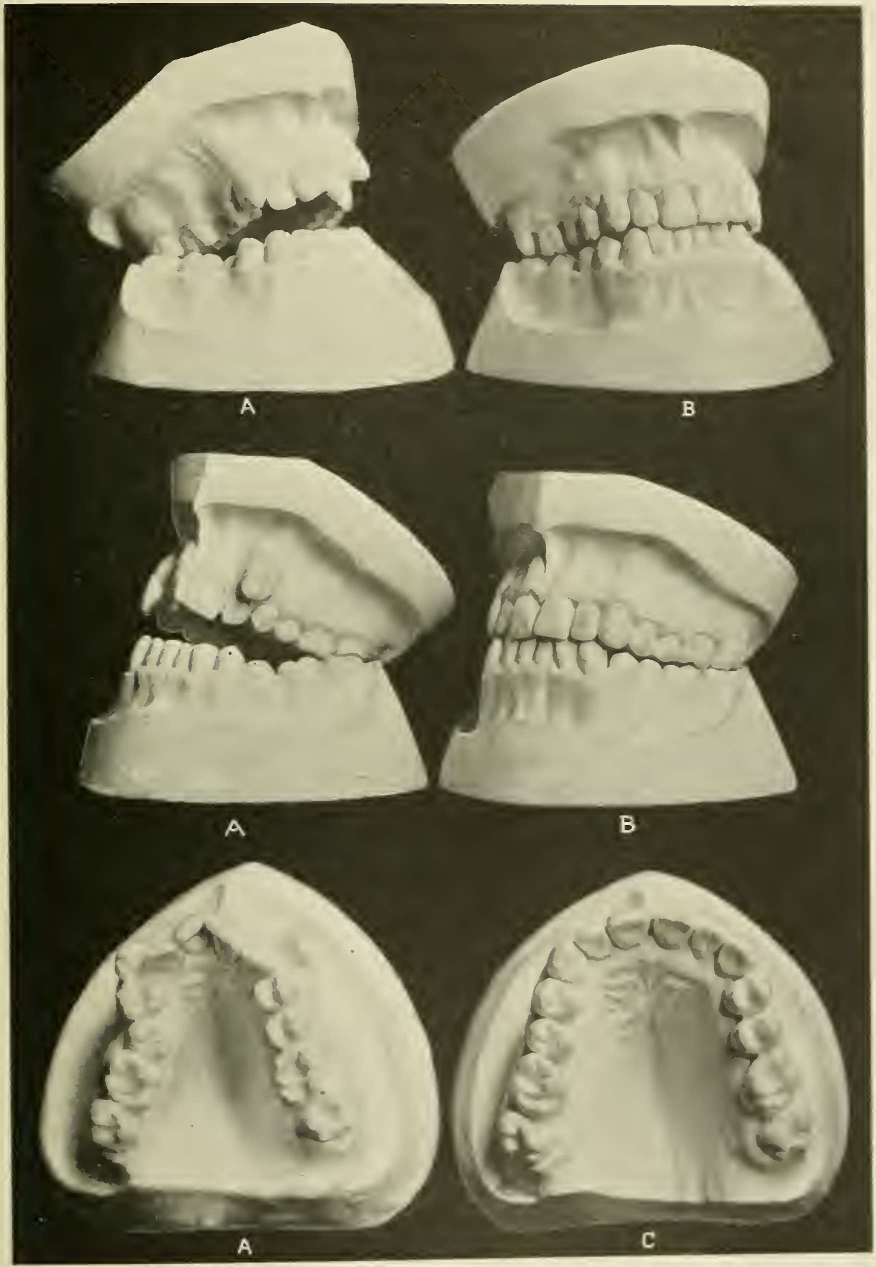


Fig. 7

breather, his nasal channels were undeveloped, and only the two molars occluding, the upper arch being considerably contracted, and all of the upper teeth anterior to the two molars being in infraversion, the arch relations in neutrocclusion. The upper jaw micrognathic. The patient could not masticate his food very well, and his inability to speak distinctly caused him to be rather timid and shun the society of his classmates. Age, 19 years.

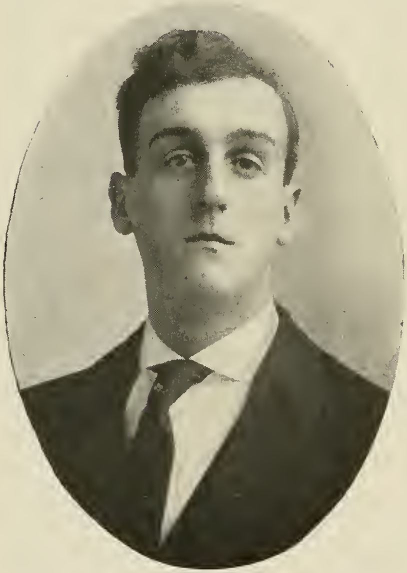


Fig. 8

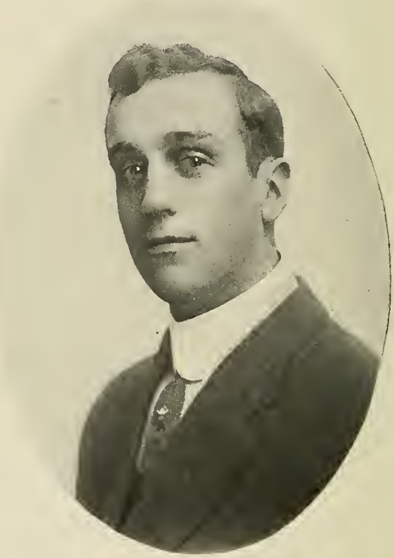


Fig. 9

Fig. 8 shows the picture of the young man undergoing orthodontic treatment. You can readily see that his dento-facial area is undeveloped, and he has a rather pinched look. On account of his being a dental student I felt that he would make an excellent clinical patient, so that his classmates might be given an opportunity to note the changes that can be accomplished in correcting his deformity. He was placed under treatment in the middle of February, 1909. The upper arch (see Fig. 7c) was slowly expanded, and at the same time the teeth were so ligated that there was a downward pressure. The young man was given the best of care possible, and a few weeks before he graduated, which was May 24, 1911, I removed the appliances and fitted the retainers.

Fig. 7b shows the present relation of his teeth. The development of the superior maxillary bone had a wonderful tendency to stimulate the enlargement of the nasal channels. The young man breathes freely through his nose, and is able to functionate his teeth properly. This slow, technical treatment was nothing but a physiological growth. I want to throw on the screen the wonderful change in the young man's face. Fig. 9. He sent to me with his picture the following letter, which I think I should read, showing his appreciation of what has been accomplished for him by orthodontic treatment.

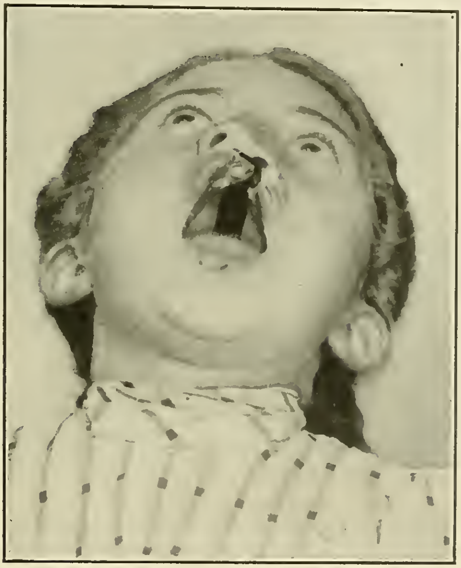


Fig. 10

"THERESA, WIS., June 28, 1911.

"DR. M. N. FEDERSPIEL,
"Milwaukee, Wis.

"MY DEAR DOCTOR:

"Have just received my license, and began to practice here. I have never so fully realized the deep gratitude I owe to you as I do now. Three short years ago I entered Marquette University and first met you. I can still clearly picture myself in that deformity which had developed in me a timidity, due to lisping, inability to talk, and a self-consciousness that every cripple develops. I was physically incompetent to cope with others in anything. I shudder to think how wholly unfit I would now be to meet the public in my chosen profession in that condition. All these drawbacks have been eliminated by the wonderful, great work you have done for me, and which everybody pronounces most wonderful.

"Wishing you the same success in still greater deeds, I remain,

"Yours very thankfully,

"ALPHONS W. KOLL, D.D.S."

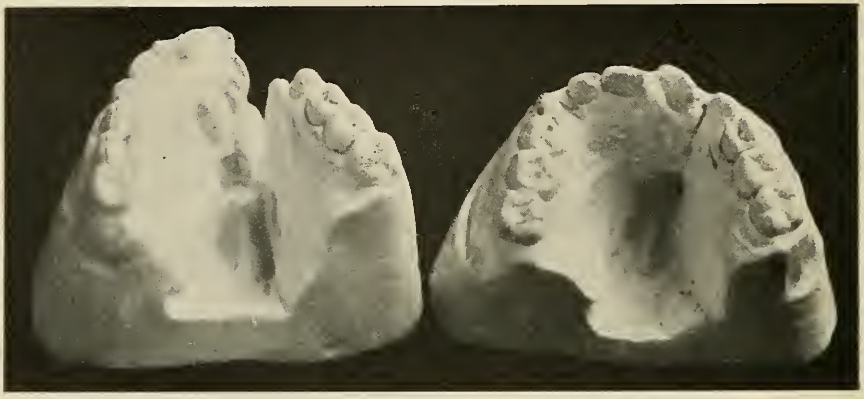


Fig. 11

Case 4. Miss E. S., nine years old; excellent health; had congenital cleft of the lip, alveolar process, and hard and soft palate. See Fig. 10.

You will notice that the alveolar process is divided between the left central and the rudimentary left lateral. The alveolar process on the right side was turned outward, and protruded to such an extent that it caused a distortion in that region. It was necessary to reconstruct the shape of the dental arch before doing anything further. The patient was anesthetized with ether, and an incision was made between the right deciduous cuspid and the right permanent lateral. The muco-periosteal flaps were raised and retracted. The exposed bone was cut one-half its thickness by a narrow, long fissure burr, then by forcible pressure the protruding alveoli containing the lateral and the two centrals were brought in contact with the alveoli on the opposite side, thus producing a green stick fracture. The contact surface was then freshened and the alveolar bones brought together. (See Fig. 11.) Then in order to immobolize these parts into their normal positions, I slipped the alignment bar into the tubing on the bands, which I had previously cemented on the posterior teeth, and ligated to the alignment wire all of the anterior teeth.

The patient's mouth was kept as clean as possible, and four weeks later the appliance was removed, and bone union had taken place. This operation restored to a fair degree the shape of the dental arch and, as a result, the cleft of the lip became more narrow. When I operated upon the patient a second time for the correction of this defect, I obtained better results than if I had attempted to close the lip before the shape of the dental arch had been restored. (See Fig. 12a and b.) The patient was instructed to report at my clinic after a summer's rest to have the hard and soft palate closed.

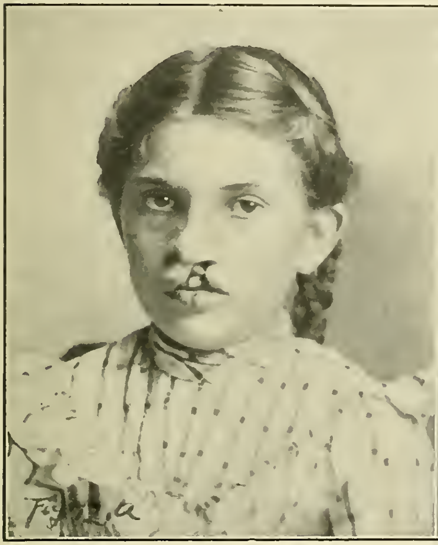


Fig. 12a

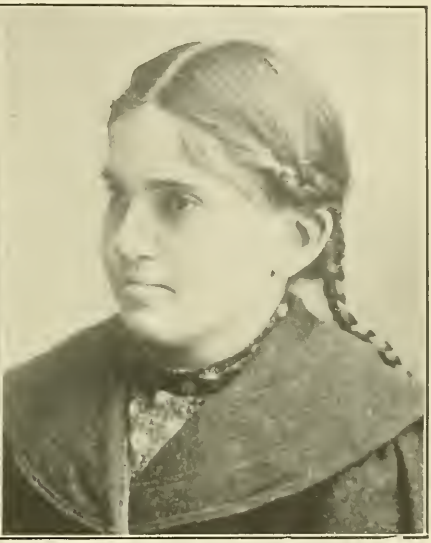


Fig. 12b

Conclusion.

The summary of what I advocate in this paper is:

(1) The importance of making a differential diagnosis between malposition of the teeth, arch malrelation, malformation of the jaws and malposition of the jaws.

(2) That correction of distal malposition of the mandible can only be made during the development of the glenoid fossa.

(3) That nasal stenosis produces inequality of muscular action, which, in turn, is influential in causing malocclusion and dento-facial deformities.

(4) That orthodontists should become proficient in recognizing defects of the nose.

(5) That it is impossible to lower the palate by widening the upper arch for the purpose of increasing the space of the nasal channels.

(6) That radical expansion of the upper arch, where occlusion is ignored, should be discouraged.

(7) That the enlargement of the nares takes place simultaneously with the growth of the maxillary bone.

(8) That the widening of the dental arches by a slow, technical treatment is a physiological growth.

(9) That in correcting alveolar clefts the shape of the dental arch should be maintained.

Discussion of Dr. Federspiel's Paper.

Dr. Lischer, St. Louis.

The essayist's first contention regarding the importance of a differential diagnosis hardly permits of discussion; it is one on which all of us can agree, providing we accept at least some of his remaining ones. But it suggests the most important question I can ask, viz., how are we to differentiate between malformation and malposition of the mandible in a living subject? I frankly confess that this appears to me a difficult point for decision. And while it may seem as an undue request, I would suggest to him, nevertheless, that he develop some method whereby such differentiation can be rendered easy and certain. I can think of no adequate reasons why such an anomaly may not be within the range of possibilities, though I have not particularly observed it. Nor has the essayist produced the necessary evidence of its existence.

The various normal developmental stages of the glenoid fossæ have frequently been referred to in our literature, particularly by MacDowell, and I hope that the essayist's promise of a more complete report a year hence will be fulfilled, and thus permit him to go into greater detail regarding abnormal cases. The importance of this subject fully warrants further investigation.

His arguments regarding the prognosis of distocclusion, that the probability of its successful treatment is in inverse ratio to the age of the patient, are well taken. Indeed, I have long been of the opinion that if we would look beyond the teeth of their immediate alveoli, if we would extend our observations beyond plaster models and include skulls exhibiting these deformities, we might arrive at conclusions of great significance. In fact, I have regarded this subject of such importance that I have had a standing order for six years with a leading osteologist to forward all such skulls to my address, but without any success.

The part played by nasal obstruction in the production of oral deformities has in recent years been thoroughly recognized. And in this connection permit me to quote a statement by Lambert Lack, which reads:

"The evils of nasal obstruction have been grossly exaggerated in some directions, and too much importance has been ascribed to quite trivial degrees of obstruction. Operations to relieve slight defects of which the patient was wholly unconscious have been so frequently performed that the whole subject has been brought into disrepute. This is very unfortunate, as the full significance of some results of nasal obstruction is perhaps even yet generally unappreciated."

It appears to me as more important that the orthodontist have the hearty co-operation of a competent rhinologist, than that he master the recognition of the various nasal defects.

I believe the evidence put forth in support of the contention that a palate may be lowered by rapid expansion of its dental arch is entirely inadequate and quite inaccurate. As Dr. Federspiel intimates, mere appearances do not prove that the palate has been lowered. Measurements, in such instances, should be made from definitely fixed points, *e. g.*, the occiput, the entrance to the external auditory meatus, etc. The adjacent teeth, which are moved during treatment, are unreliable points.

Dr. Federspiel has failed to mention the variations of the symphysian angle, which at times fall within the range of the pathological, and the deformities of the lips. Redundancy or deficiency of these parts, particularly the latter, frequently affect the profile to such an extent that orthodontic treatment without the aid of plastic surgery is decidedly inadequate for the restoration of normal facial contour. All his other arguments I heartily approve.

Finally, his paper silently emphasizes a point to which he does not refer, but which to me seems most important, viz., the keeping of records. Many of the questions he has put before us could be definitely settled if we had kept better records, and had so classified their data that they would be more readily available.

Dr. Flint. The essayist first deals with classification. It was my pleasure this summer, during my vacation in Canada, to run into this same "nightmare" or bone of contention. The speaker on that occasion tried to tell me that the Angle classification was not scientific, simply because the naming of the divisions by numbers meant really nothing. Let us see—a science is something that is based upon three things, namely, systematic observation, experimentation, and reasoning, and in the light of this the thousands upon thousands of cases that have been successfully treated bear ample testimony of the value of the diagnostic scheme. As has been said, next to the law of occlusion, this scheme is our greatest asset. It is a bread winner.

The terminology that has been suggested for the Angle classification sounds well, but I think you will find the student in college will have even more trouble remembering the same than Class I, Class II and Class III.

The Lischer terminology is perfectly intelligible to me, and being of Latin origin would seem admirable, but, after all, it is the Angle classification in a new dress, with one slight addition.

The essayist says that after much experience in treating Class II cases in the 1st division, at the age of twelve and shortly after, he is unable to retain the same "in most cases." Gentlemen, I would not want to send my child to him. If he knows before he starts that he cannot retain the case he should not take the child's time and the parents' money. We are all willing to work for the really young, because of the absolute sureness of our results, but the essayist has made entirely too broad a statement in regard to older patients. Some of my own best work in this class of cases has been accomplished at this very age. The fact is, I am coming to the conclusion that it is not so much a question of age, as having the *hearty* co-operation of the patient.

What the essayist says about the impression that the removing of abnormal bodies will restore to the child normal breathing is all too true, and I find that rhinologists who know better do not even put forth an honest effort to give the child its due. When asked the reason why, what answer do you suppose was forthcoming? This was one: "Oh! I hate to tell them of the added expense, namely, the necessity of making the jaws normal in order that there might be normal lip function."

The essayist is "convinced that there is no change in the palate bones after extensive expansion." I hope to learn something at this meeting which will convince me just the other way, but I must have more than opinions and speculations. We have all the testimony in favor of a change in the palate bones, but circumstantial evidence does not convict in orthodontia.

Regarding the opening of the suture, the essayist says it is not done after a certain age. If he had been at the late National Association meeting in Cleveland he would have learned that a number of men are treating these very cases of Class II in that manner, and with the purpose of greatly shortening up the work. In this method of treatment the cuspid roots are carried out bodily.

Dr. Casto. Just one word in regard to classification. It seems to me that before we make a comparison of these two classifications a complete understanding of them is necessary. Many men are endeavoring to use Angle's classification as a complete guide to diagnosis and complete indication of the treatment in a given case. It should not be so regarded at all. The classification applies to the models, and only makes up a unit of the complete diagnosis and the treatment of a case. That is misunderstood by a great many people, and I think that the men who are endeavoring to change the classification are endeavoring to supply a classification which will indicate a complete diagnosis and treatment for a given case.

In regard to the lowering of the hard palate and the expansion of the dental arches, I think the men are deceived. I agree with Dr. Federspiel that the hard palate is not lowered in its relation to the occlusal plane of the teeth. It is lowered in the proportional relation to the width of the arch, and there is a lowering of the hard palate in its relation to the other bones of the nose, of the nasal cavity, so that you get an enlarged breathing area by that growth, which is between the upper attachment of the superior ethmoid bone and the palate.

Dr. Ernest Walker. I hardly think Dr. Casto's explanation will be borne out by Dr. Angle's explanations of his classification in his publications. Certainly the great value of this classification is that it not only diagnoses the case, but indicates the treatment.

Two years ago I made a statement that while the classification did answer the purpose as far as diagnosis is concerned, that it was not a guide as to treatment. If Dr. Casto were speaking for Dr. Angle, and if the Alumni wish to admit this, that is to say the failure of the classification in regard to treatment——

Dr. Casto. I am not speaking for anyone on this subject.

Dr. Walker. I have reason to believe that Dr. Angle has reached that conclusion himself.

Dr. Lischer. May I be permitted another word, inasmuch as my name has been introduced here very much against my wishes?

In regard to my terminology, I do not care what you call it. It is not at all based upon treatment, has nothing to do with treatment; but it is based upon pathology, and upon what else should diagnosis be based? Treatment is an after consideration. Now, I noticed in teaching this subject that the classification to which we have all been accustomed had its shortcomings. First of all, it is not sufficiently comprehensive. For instance, it says nothing in regard to an undeveloped mandible. Its terminology is not scientific; numbers are not applicable to pathological conditions, and before I had my own terminology I felt ashamed to talk with a rhinologist and speak of a Division 1, Class 2 case. So I have honestly tried to get terms for that purpose, and to me they have been satisfactory.

Dr. Federspiel. In answer to Dr. Lischer's statement—"How are we to differentiate between malformation and malposition of the mandible?" I will say that unless one thoroughly understands the anatomy of the face and head, together with the different landmarks, it is impossible to recognize the difference between a normal and an abnormal case. In order to recognize malformations and malpositions of the teeth, arches, jaws and face, one must be familiar with their embryological and anatomical development. Some orthodontists still believe that the upper first molars can always be used as a guide in making a diagnosis of an arch malrelation. Though it has been proven time and again that its position is not always normal, yet it plays an important part as an aid in diagnosing. I consider the lower first molars equally, if not more, important as an aid in diagnosing. But we must not forget that the position of the mental foramen, Stensen's duct, the mental tuberosity, the upper and lower frenum, the shape of the mandible, the inequality of muscular action, the condition of the nasal channels, the age of the patient, rickets, heredity, and so on, must be considered in making a diagnosis.

I am amazed that my friend, Dr. Flint, can pay the Angle classification no higher compliment than to say "It is a bread winner," but I fear that the Doctor is not well informed along embryological and anatomical development, together with the prognosis of extreme dento-facial deformities. Careful study of my paper with the report of cases substantiates the fact that our present method of diagnosing, wherein the occlusal inclined planes alone guide us, is not sufficiently comprehensive for the specialist who desires to correct deformities which extend beyond the confines of abnormal positions of the inclined planes. I am not questioning the classification laid down by Doctor Angle; it deserves all the credit we can give it, but it has its limitations, and is very much in need of a better terminology. Students who have a knowledge of Latin prefer names that have a meaning. Suppose you examine a patient's heart and discover that there is an inflammation of the pericardium, and you diagnose the case as heart disease, Class 2, Division 1; it means nothing; but if you say the patient is suffering from pericarditis, you have made a definite statement. Again, suppose the patient has an inflammation of the pulp of a tooth, it would not be well for us to say toothache No. 7; but if we say pulpitis, the term means something. It seems to me that the time is ripe for a body of professional men to discuss diseases and deformities by names which can be analyzed instead of being coined to suit the taste of an individual.

Now about distal malposition of the mandible. Again, Dr. Flint fails to differentiate between distal malposition of the mandible and a distocclusion of the lower arch. A knowledge of the embryological and anatomical development of the temporo-mandibular articulation has satisfied me that after the developmental period it is very difficult to permanently retain a distal malposition of the mandible in a normal position in order to establish neutrocclusion and harmonious facial lines. It is well for me to state that the mesial shifting of the lower arch in the jaw in cases where the lower jaw is distal to normal, so as to obtain normal occlusion, is pseudo-orthodontia.

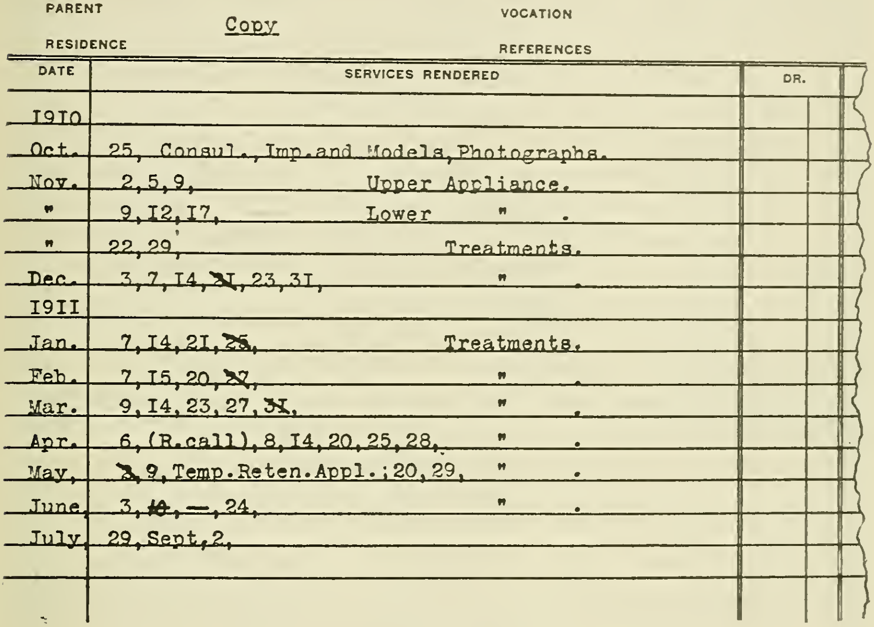
Do Orthodontic Appliances Adversely Affect the Health of Our Patients?—A Case from Practice.

By B. E. Lischer, D.M.D., St. Louis.

Now that the critics of orthodontics are abroad in the land, exhibiting an utter disregard for truth, additional data in refutation of their conceited counterviews may be of value. And though their case thus far has failed to rise above extreme generalizations without foundation in fact, there is ample evidence on every hand that their absurd and untruthful contentions are being seriously accepted in many quarters. Hence I offer the following interesting case from practice for your consideration.

History. On October 25, 1910, I was consulted by Dr. C. B., a practicing physician, regarding his daughter M——, age twelve years. On examination I found a bilateral distoclusion, complicated by extreme labioversion of the upper incisors and a pronounced distortion of the facial lines. I called the father's attention to the fact that dento-facial deformities of the type presented by his daughter are almost invariably associated with nasal obstruction—usually adenoids. Whereupon he related that she had suffered from chronic rhinitis for a number of years, for which he had frequently administered the routine palliatives, but without success. I therefore recommended consultation with a rhinologist, who subsequently found adenoids and hypertrophied inferior turbinates. These were promptly removed, after which I began treatment for the oral deformity.

Treatment. Reference to her record, Fig. I, will indicate the various stages of the treatment thus far administered. This progressed in the usual manner for a period of two months with but one broken appointment on December 21, on which day a telephone message announced that she was slightly indisposed. On January 25, a similar message announced indefinite cancellation of the appointment. Treatment was resumed, however, on February 7, when my attention was directed to a mild urticaria affecting the lips and nose, but which at the time was rapidly disappearing. On the 27th, illness again prevented her coming for treatment, and on the following day her father announced the return of the urticaria in more severe form. He also wished to know whether such attacks were common occurrences during orthodontic treatment, and I assured him that I had never had a similar experience, nor had I ever seen a report of one in our literature.



PARENT
Copy
RESIDENCE

VOCATION
REFERENCES

DATE	SERVICES RENDERED	DR.
I9I0		
Oct.	25, Consul., Imp. and Models, Photographs.	
Nov.	2,5,9, Upper Appliance.	
"	9,I2,I7, Lower " .	
"	22,29, Treatments.	
Dec.	3,7,I4,~~2I~~,23,3I, " .	
I9II		
Jan.	7,I4,2I,~~25~~, Treatments.	
Feb.	7,I5,20,~~27~~, " .	
Mar.	9,I4,23,27,~~3I~~, " .	
Apr.	6,(R.call),8,I4,20,25,28, " .	
May,	~~3~~,9,Temp.Reten.Appl.;20,29, " .	
June,	3,~~I0~~,—,24, " .	
July,	29,Sept,2,	

Fig. 1

On the 29th, inquiry as to her well-being brought the reply that she was slightly improved, though he had called in Dr. T., a consultant, who was inclined to the belief that the urticaria was due to an irritation of the gastro-intestinal membrane, and that my appliances were, in all probability, instrumental in producing it. But my renewed assurance to the contrary was again accepted.

The patient reported at my office on March 9th entirely well, accompanied by her father, and our conversation naturally turned to the topic now uppermost in our minds. I have thus far failed to relate that the appliances were of German silver, plain finish, in combination with silk and wire ligatures and intermaxillary elastics. And though some oxidation had by this time taken place, there was no undue corrosion of the metal to be noted. I explained to the father the chemical changes resulting from the action of the oral secretions on the metal, which had only recently been the subject of the most painstaking investigations (Grieves), and that digestive disturbances might ensue in cases presenting rapid oxi-

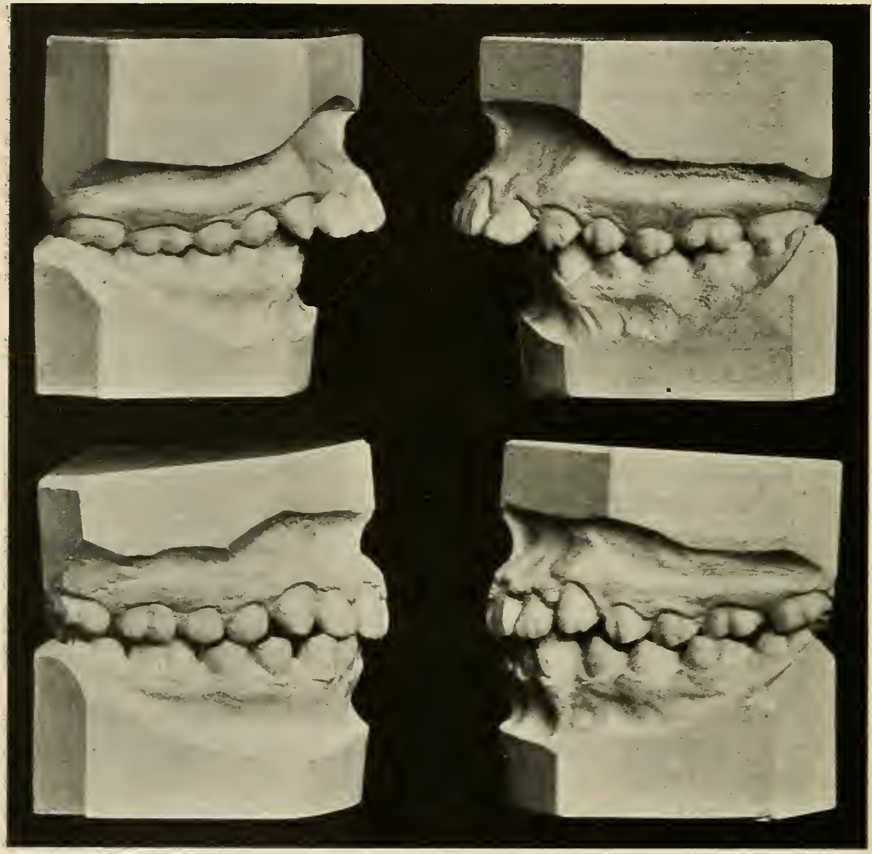


Fig. 2

dation and corrosion. But his intelligent interest in the matter prompted me to plead for a postponement of decision, to which he readily consented.

Normal conditions now continued until the 30th, with consequent broken appointment on the 31st, and a prolonged interruption of treatment following. The skin affection again returned and reached its height on April 6th, when I was called to her residence, so that I might see the severity of the attack, for by this time it covered the nose, lips, cheeks, parts of the neck, forearms and hands. Examination of her record card now revealed such a periodicity in the attacks that the father came to a definite conclusion. He now felt confident that a disturbance of the functions incident to the advent of puberty was the cause, and not the appliances. Though such disturbances are quite common, he had never had a similar case in a practice covering twenty years. Consultation with a dermatologist now established his diagnosis, and orthodontic treatment was again resumed on the 8th.

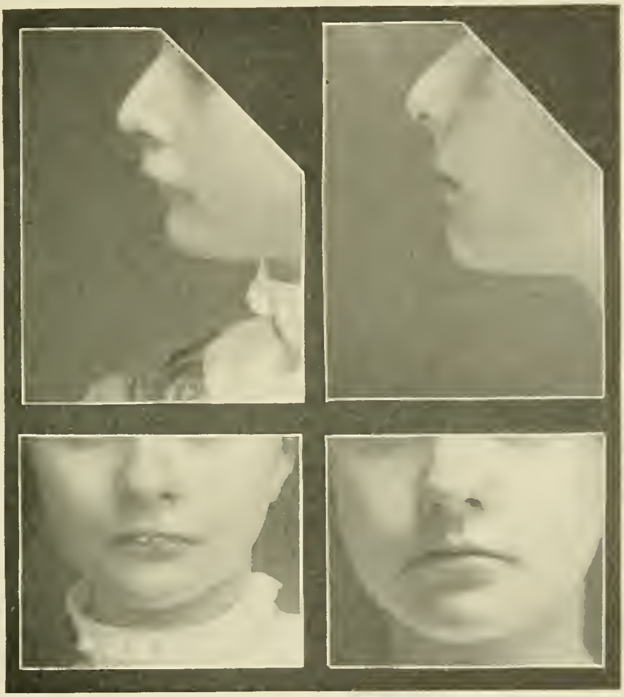


Fig. 3

On May 2d, another interruption occurred, but without the urticaria, for by this time the indicated constitutional treatment had been administered. Nevertheless, by mutual agreement, the application of temporary retention appliances was now provided on the 9th, followed by visits to the office on the 20th and 29th, and June 3d. The appointment for the 10th was again cancelled, and on the 24th the father reported that menstruation had begun during the interim.

The malocclusion prior to treatment, and the progress attained at the time temporary maintenance was provided, are shown in Figure 2. The vast improvement in the facial lines is clearly set forth in Figure 3. Subsequent visits have shown her in excellent health and without recurrence of the urticaria.

Conclusion.

But the experience which I have thus briefly set forth has often impressed me, and I cannot but reflect on my good fortune that the father, in this instance, was a physician, a liberal-minded man, with whom one could reason. And again, had it been otherwise, and had the little girl fallen into the hands, *e.g.*, of a family doctor with anti-dental proclivities, or an orthodontist of the "Rip Van Winkle variety" (who resorts to extraction of teeth not only to avoid the production of "Rooseveltian type of jaws," but "periods of stress," "shattering of the nervous system," etc., etc.), how promptly I would have been accused of malpractice. It is not difficult to imagine their supreme satisfaction in being accorded another opportunity to proclaim to the world: "Orthodontics is a failure." And how they would have extolled the petrified conservatism of the stand-patter!

But I am sure you will agree with me that my continuation of the treatment under the circumstances was justifiable, and that the results thus far attained are all that can be desired. A resumption of treatment for a short period this autumn will result in a complete and permanent correction of the deformity. And, finally, the amount of metal now anchored on her teeth for the maintenance of the newly established relations practically equals that of the treatment appliances, yet there has been no return of the urticaria, now that menstruation is established.

A Study of Maxillary Movement.

C. A. Hawley, D.D.S., Washington, D. C.

The movement of the two halves of the superior maxillary bone has been observed and commented on for more than fifty years. Dr. E. H. Angell, of San Francisco, described this phenomenon in the first volume of the *Dental Cosmos,* 1860, and from that time to the present many others, among them Drs. Farrar, Black, Ottolengui, G. V. I. Brown and Francis A. Faught, have noted this movement as indicated by the separation of the central incisor teeth, when force was applied across the vault of the mouth. Dr. Angell ascribed the separation to the opening of the intermaxillary suture. In the case reported by him the patient was a girl fourteen and a half years of age. A jack screw was placed across the mouth attached on the right side to the first and second bicuspids, and on the left side to the second bicuspid only. The patient was directed to turn the nut of the jack screw twice a day. He says (*Dental Cosmos,* Vol. I, 1860, p. 540): "These directions were industriously followed, and at the end of two weeks the jaw was so much widened as to leave a space between the front incisors . . . showing conclusively that the maxillary bones had separated, while the left lateral incisor had been brought completely outside of the inferior teeth."

Commenting editorially on this report in same issue of the *Cosmos,* Dr. J. H. McQuillen, of Philadelphia, says: "With no disposition to assert that such a thing is utterly impossible, yet taking into consideration the anatomical relations existing between the right and left superior maxillæ and the other bones of the face with which they articulate, such a result appears exceedingly doubtful. Even admitting the impression of the writer to be correct, it would be a very strong argument against the use of such an apparatus, for surely the irregularity of the teeth is a trifling affair as compared with the separation of the maxillæ, which could not take place without inducing serious disturbance in the surrounding hard and soft parts."

I quote the description of this early reported case and the criticism of it, because it seems to represent quite clearly the attitude towards the operation for twenty-five years or more, and, to a considerable extent, even at the present time.

In 1893, in a paper before the Columbian Dental Congress, Dr. C. L. Goddard, of San Francisco, reported a case of a young lady of fifteen in which this phenomenon occurred. The appliance was arranged with bands for the first molars and first bicuspids united on the lingual side with a straight bar. No attachment was made to the anterior teeth, but the jack screw was placed across the mouth against the bars, and the nut turned twice daily for three weeks. At the end of that time the space between the bicuspids was increased one-fourth of an inch; between the cuspids three thirty-seconds and between the centrals one-sixteenth of an inch. It was accounted for by the separation of the two halves of the maxilla in the median line.

Dr. A. E. Mattison, in the discussion of Dr. Goddard's paper, reported a case where, with a jack screw between the cuspids, he had separated the centrals one-twelfth of an inch.

At this time there seems to have been a general recognition of the fact that the intermaxillary suture might be opened, and the general feeling was prevalent that it was not desirable. Dr. Farrar, 1888, devotes a chapter in his book, Vol. I, to its consideration, cautions against it and describes an appliance for its prevention.

Many others have noted this appearance of space between the incisor teeth, and have universally attributed it to the separation of the maxillary bones, and also have generally considered it undesirable, if not alarming. In fact, the attitude of Dr. McQuillen has been the generally accepted attitude, up to about ten years ago.

My own early experience with this phenomenon has been similar to that of many others as confided in private conversations, and recorded in the literature. About fourteen years ago I placed a jack screw across the palatine vault of a young man of fifteen, whose arch was considerably narrowed. I gave him a wrench and told him to turn the nut as fast and as often as he could without giving himself any pain. He appeared in thirty-six hours with a space of one-eighth of an inch between the central incisors. In alarm I at once removed the jack screw and allowed the teeth to return to their former positions, tied them together and proceeded more slowly.

It is very interesting to note an exception to this general attitude toward opening the suture by that most careful and accurate observer, Dr. G. V. Black. In the general discussion of a paper by Dr. Case on "The Widening of the Arch," he says: "I have one point in the widening of arches that I wish to recommend, because I have had such good results from it in my own practice, though I would not recommend that the effort to obtain it be too strongly made; that is, to put in split plates for young patients when we want to widen the arch, or put in the best anchorage you can get against the teeth; then put in a jack screw between and open the suture of the maxillary bones carrying the incisors directly apart and carrying the two halves of the jaw apart. There is nothing that gives me so much pleasure as to see the suture open readily and widely. It can then be held until it is closed by a new formation of bone. I have done this in a number of instances with the happiest results. There is no movement of the teeth in the sockets. The movement is accomplished quickly and satisfactorily, but you cannot do it in every case, and you should not try to except with young patients."

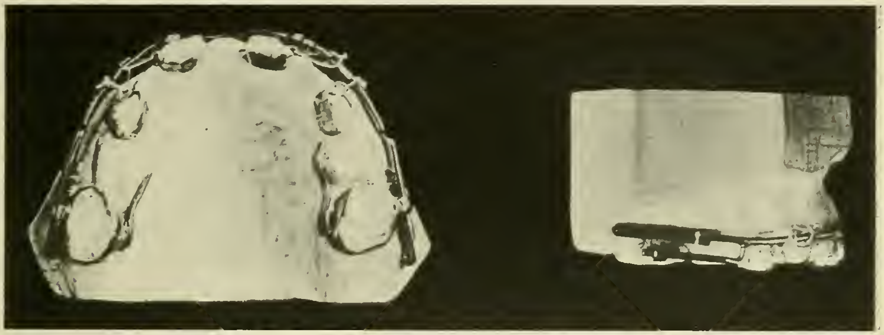


Fig. 1.

Before the Section of Orthodontia, Fourth International Dental Congress, 1904, Dr. Ottolengui read a paper entitled, "Spreading the Maxilla vs. Spreading the Arch."* As described in the paper the author had proceeded with the conviction that no harm could come from opening the suture, and he reports a series of operations extending over a period of ten or fifteen years, with this particular result in view. The appliance used was a thick vulcanite plate, the force being obtained by a square piece of dry pine wood inserted in the center. Accepting the view that the suture could be opened, he ligated the incisors and temporary molars to the two halves of the plate, and successfully produced the phenomenon in every case.

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*Also see Dental Cosmos, 1897, Vol. XXXIX, Pages 138-9.

It should be noted here, that in other methods where the anterior teeth were left free the characteristic space between the central incisors did not always appear, but sometimes the space appeared between the lateral and central, and sometimes between the lateral and cuspid.

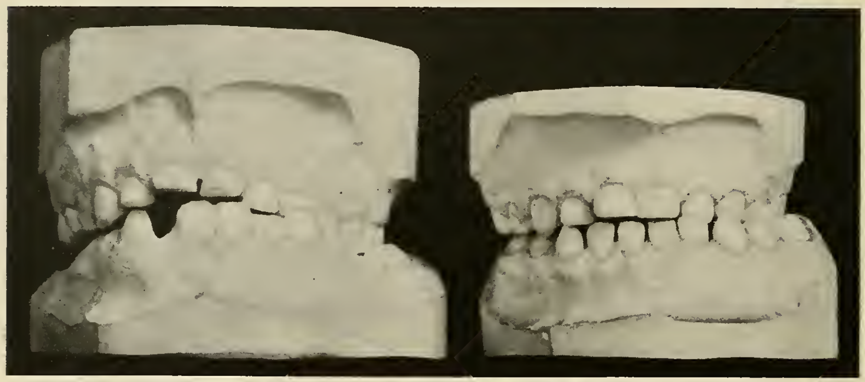


Fig. 2.

Dr. G. V. I. Brown (*Journal of American Medical Association,* 1909, and *Dental Cosmos,* 1909) claims originality for this operation for the definite purpose of producing more nasal space. His attachment to the teeth is by cemented bands on molars and first bicuspid, or cuspid with a lingual bar and a jack screw across the mouth. He says (*Cosmos,* 1909, p. 9): "By the aid of pressure, which is so gently applied that there is no pain and but little inconvenience, it is possible in all young persons to force the maxillaries apart, by separating the median suture extending between the central incisor teeth and on through the central portion of the hard palate. . . ." Evidence of this is given by the fact that the central incisors are moved apart without an attachment or a direct pressure of any kind being applied to these teeth. Dr. Brown also offers as proof that the suture is actually opened, the performance of the same operation on fresh cadavers and on skulls.

Dr. Francis A. Faught, in a paper entitled "The Relation of Upper

Respiratory Obstruction to Oral Deformity," before the Section of Stomatology of the American Medical Association, at a meeting at Atlantic City, June, 1907, discusses the value of the operation of opening the suture, and while recognizing that stimulation of normal growth is an important factor in producing the improvement in nasal conditions after widening the dental arch, yet concludes that "Operations designed mechanically to increase the respiratory capacity of the nasal tract are practically valueless unless the intermaxillary suture is separated, as shown by increase of space between the central incisors."

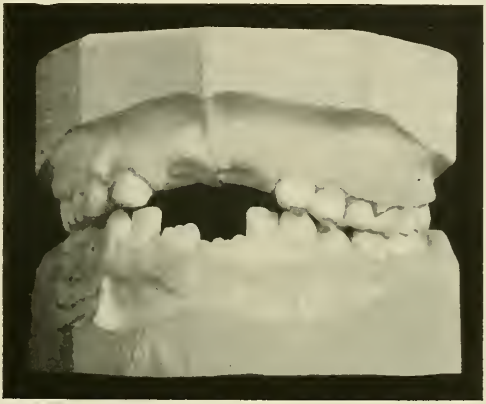


Fig. 3.

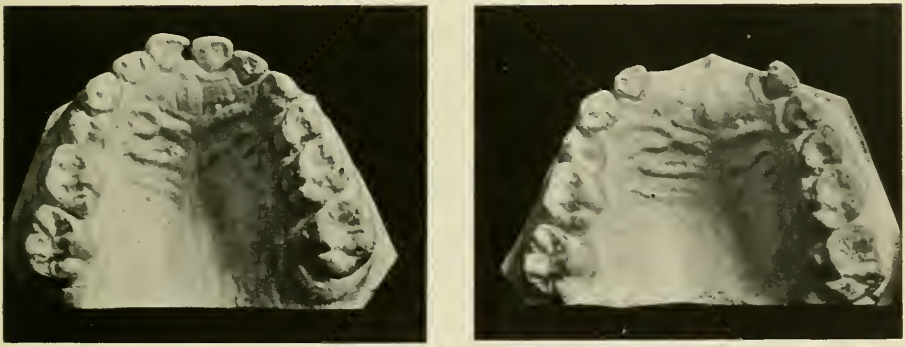


Fig. 4.

For a number of years this operation has appealed to me as a valuable one that should, in some cases, be adopted as a regular procedure in orthodontia. The direct benefit to the nasal tract is obvious, and it may be noted that no harm from it has ever been reported. The objections raised from that standpoint have been entirely theoretical. The real objection has been the crude character of the appliances as compared to the appliances generally adopted for the regular work in orthodontia, and the fact that a complete new appliance had to be substituted to complete the case.

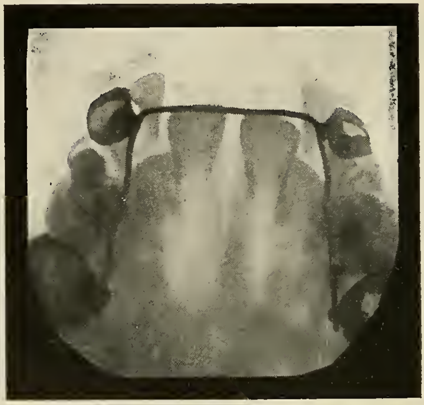
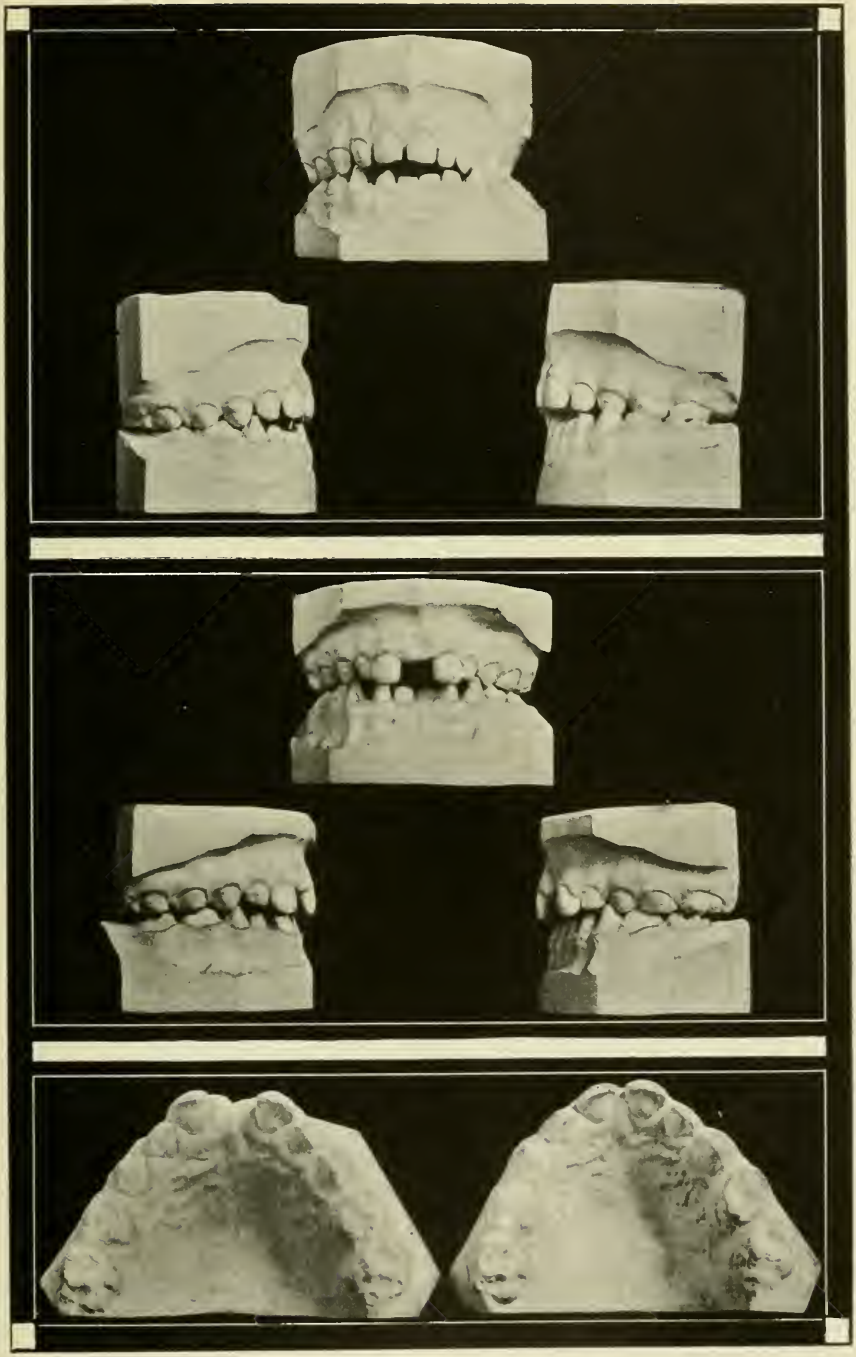


Fig. 5.

The Author's Recent Experiences.

In January, 1909, I made the first experiment upon a patient, a boy, age seven and a half years. The appliance used in this and following cases was substantially the one shown in Fig. 1, a divided arch, 16-gauge, with a device at the ends to prevent tipping the molar teeth. Spurs were soldered on the arch back of the nuts on the divided portion from which to ligate to the central or lateral incisors, so that the force exerted laterally by turning the nuts is exerted upon the center of the dental arch, acting so as to carry the two halves directly apart as in the jack screw across the mouth or the Ottolengui split plate. Heavy irridio-platinum, 19-gauge wires were used along the lingual surfaces of the deciduous molars attached to the cuspids or in some cases to the centrals, and in others to the laterals. To carry out the molar portion, I depended on the spring of the stiff 16-gauge arch, the tension of which, in this arrangement, is increased materially every time the anterior nuts are turned. The advantage of the appliance over those previously used for this purpose lies in the fact that there is nothing across the palatine vault, and that it can be quickly removed and replaced by a regular arch, if desired, to complete any details of placing the individual teeth, after the desired width is obtained, or the case may be com-



Figs. 6, 7 and 8.

pleted without replacement. Fig. 2 shows the models of this first case at the ages of four and seven. At four the upper deciduous molars and cuspids were lingual to the lowers on the left side. At seven the first permanent molars had erupted in the same relative position. However, while the patient seemed to rest the jaws more often in this position, the upper arch seemed to be bilaterally contracted, and the bite was almost as often lingual on the right side as on the left. For this reason the arch was expanded equally on both sides.

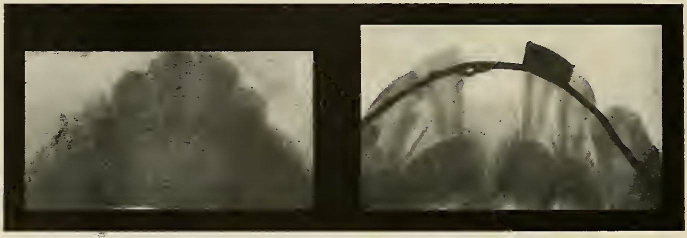


Fig. 9.

In the appliance used on this case and the two following to be described, the device for preventing the molars from tipping was the split buccal tubes. In the first one the central incisors were loose and almost ready to be shed, so the laterals and cuspids were banded and a small wire loop soldered to the upper distal edges of the bands to hold the ligatures. The lingual wire was soldered to the molar and cuspid bands. The ligatures used were the No. 3 grass line. As this ligature contracts instead of stretching under tension, it is possible to get the entire force of the screws on the teeth, and I consider it valuable in this place. The adjustment of this appliance was completed January 12th, and it was cemented to place, and the arch inserted with very slight tension. The teeth showed no soreness, and in three days, January 15th, the arch was removed and bent to give it considerable tension. The cuspids and laterals were also ligated to the arch with the grass line at this time, but the nuts were not turned until a couple of days later, from which time they were turned twice a day until they were tight, but not enough to cause pain.

On the 17th the space had widened between the laterals eleven-hundredths of an inch; on the 19th, eighteen-hundredths; on the 20th, twenty-three-hundredths. Observing at this point that the molars were not moving quite so fast as the anterior part of the arch, I did not again turn the nuts until the 24th, to allow the spring of the arch to move the molars and catch up. On the 24th, the nuts were turned again, and on the 28th the space between the laterals had increased to thirty hun-

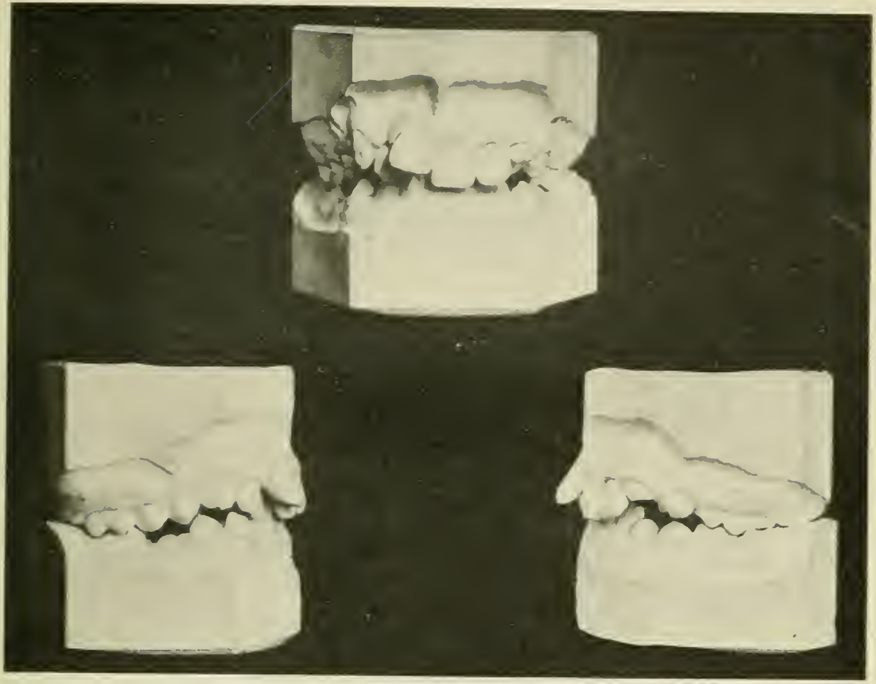


Fig. 10.

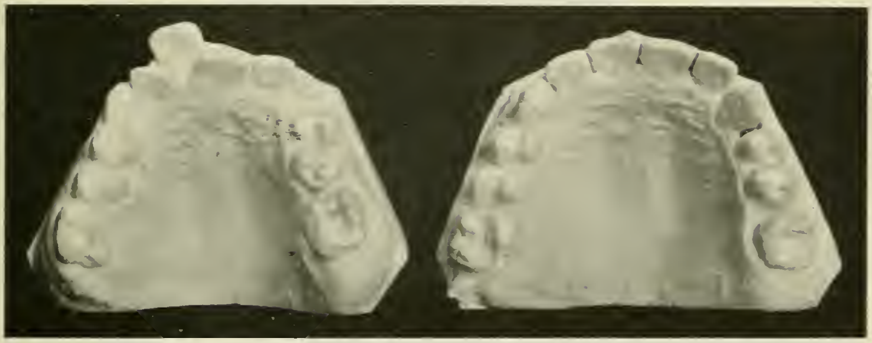


Fig. 11.

dredths, and the molars were nearly over to normal with the lower. The anterior portion was again allowed to rest until February 3d, when the occlusion was normal. On February 6th, the case was retained. The space gained between the incisors was a little more than necessary, so in

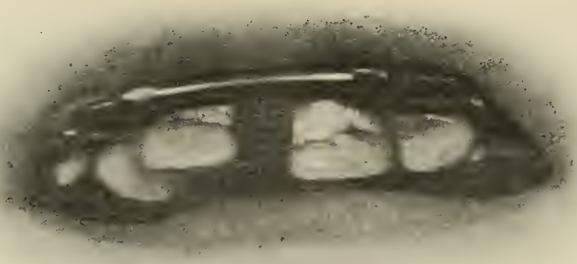


Fig. 12.

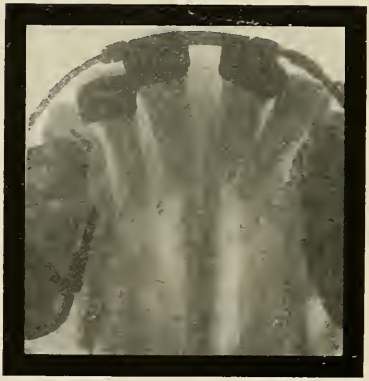


Fig. 13.

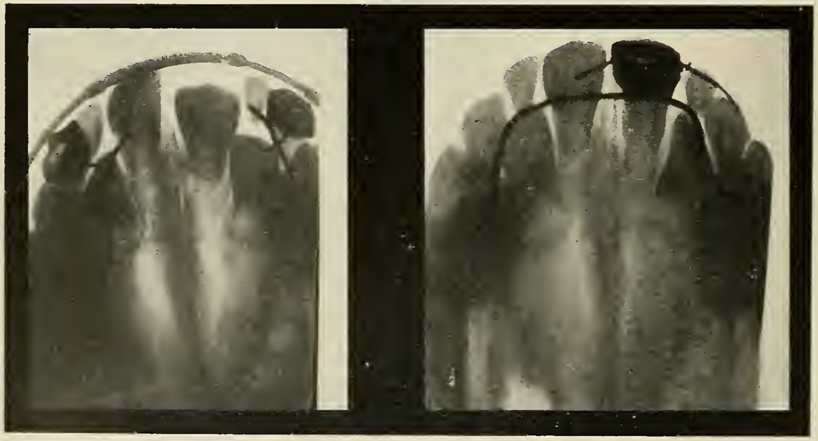


Fig. 14.

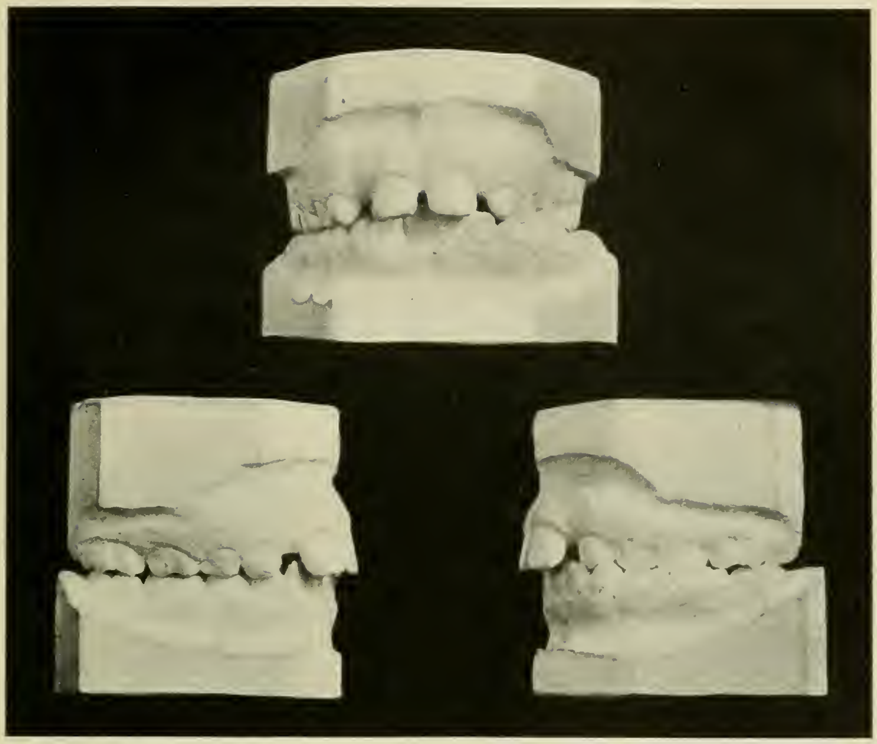


Fig. 15.

retention it was allowed to drift back five-hundredths, making the space gained between the laterals twenty-five-hundredths. The space gained in the cuspid region was seventeen-hundredths, measuring from the outside of the teeth. During the treatment the central incisors, which were very loose at the start, were shed. The appliances were in the mouth twenty-two days, or a day more than three weeks, and the active movement was accomplished in about fifteen days.

This patient was in my own family where I could watch him closely, and at no time was there any soreness or pain, or any serious interference with the usual use of the teeth in mastication. In fact, as soon as the buccal cusps of the molars rose over the cusps of the lower teeth, the patient noticed that he could use the teeth better and bite harder than ever before. The occlusion of the teeth at the end of the operation is shown in Fig. 3, and the palatal appearance in Fig. 4.

This case presented all the phenomena that have been described as opening the suture, and it was my own belief at the time that that was what was taking place. The patient was shown to a number of dentists

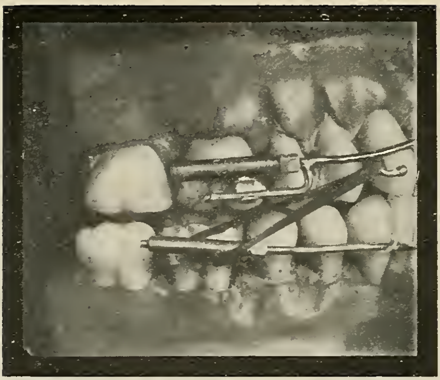


Fig. 16.

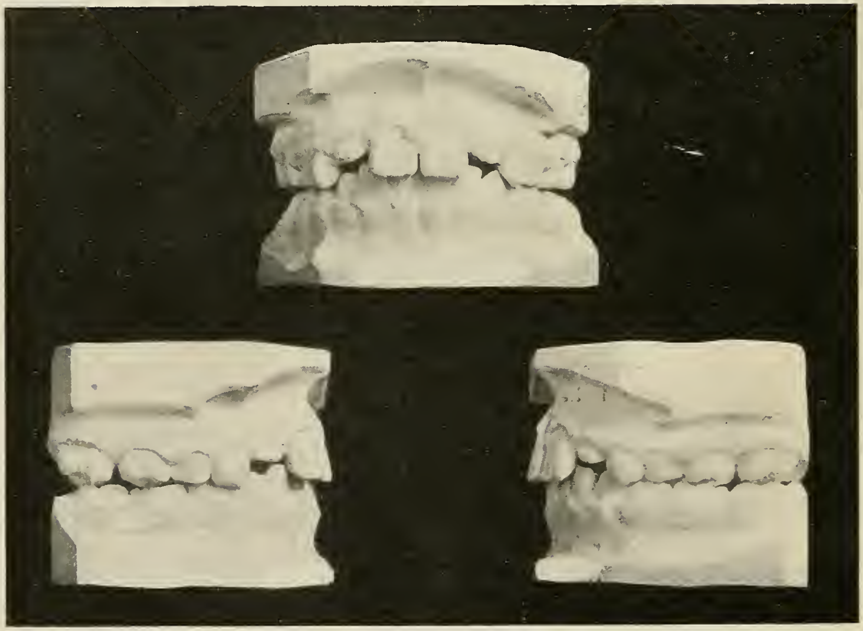


Fig. 17.

at my office during treatment, and presented at a meeting of the District of Columbia Dental Society, and the opinion was generally expressed that the maxillary suture had been opened. The typical depression described in such cases could be felt at the center between the incisors, and all the evidence of this movement, as described by different writers, seemed to be present. At the conclusion of the treatment, after the appliances were removed and the retention adjusted, a radiograph was made of the palatine vault to show the condition of the suture. This radiograph is shown in Fig. 5. A slight separation of the suture is seen, but not enough to account in any way for the movement, and not more than is often seen in normal cases.

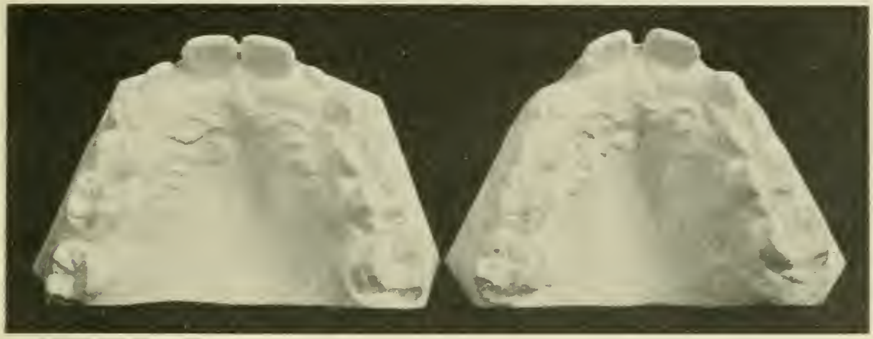


Fig. 18.

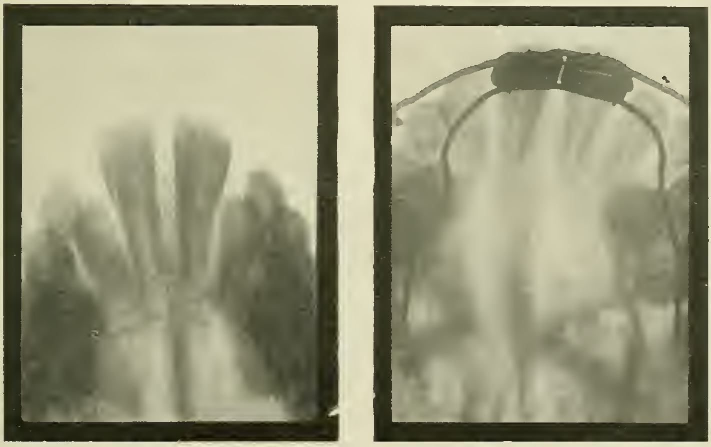
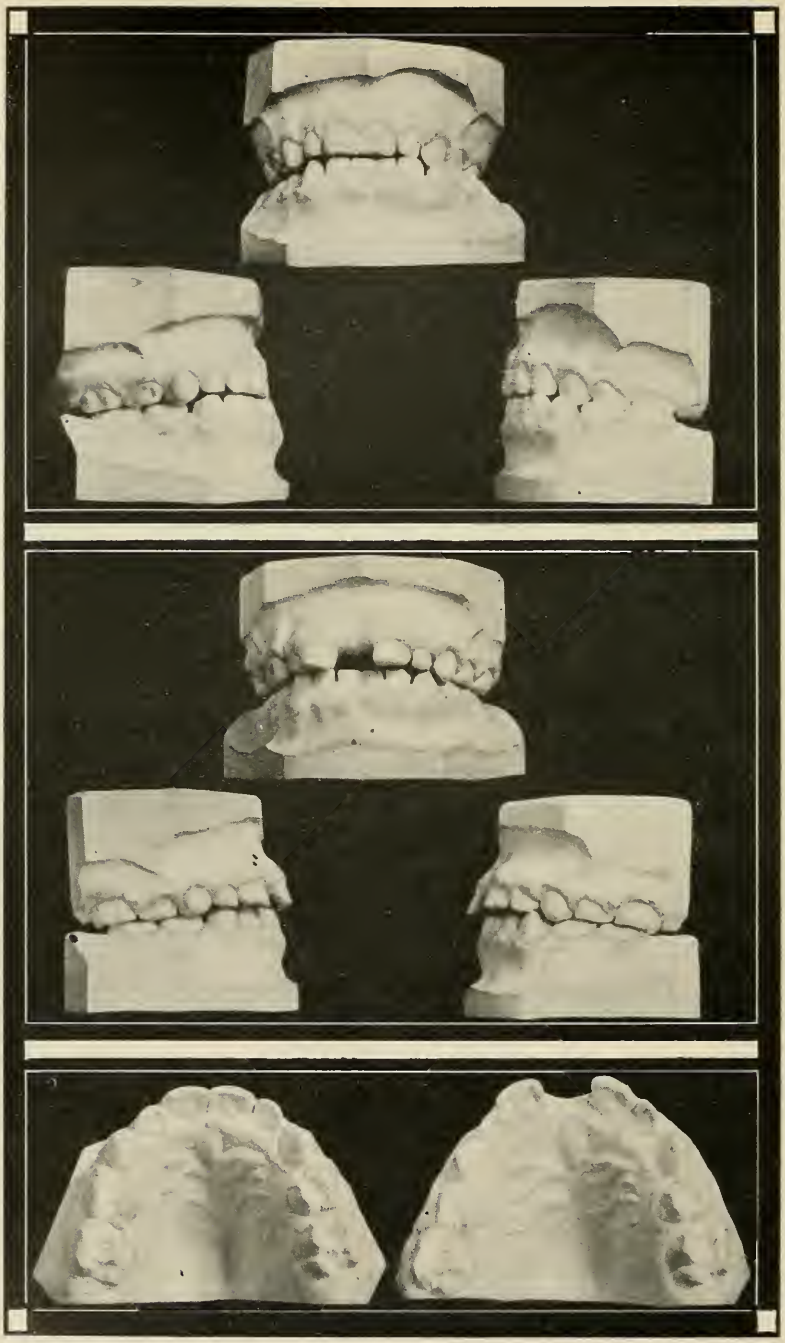


Fig. 19.

Case II. In the same month, soon after the first case was finished, a boy four years old was sent to me by a rhinologist of Washington, who stated that he had removed adenoids, but there was present a deflected septum. The condition of the teeth is shown in Fig. 6, a narrowed upper arch and lingual occlusion on the left side. The treatment was very similar to the preceding case, except that the central incisors and second temporary molars only were banded, and the lingual wires soldered to both, thus precluding



Figs. 20, 21 and 22.

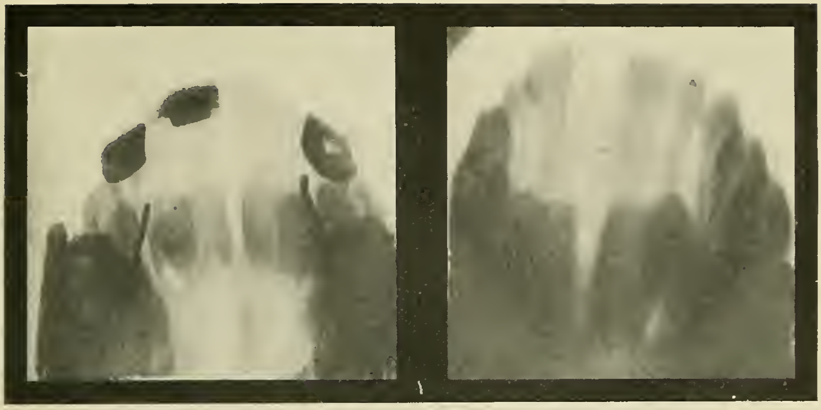


Fig. 23.

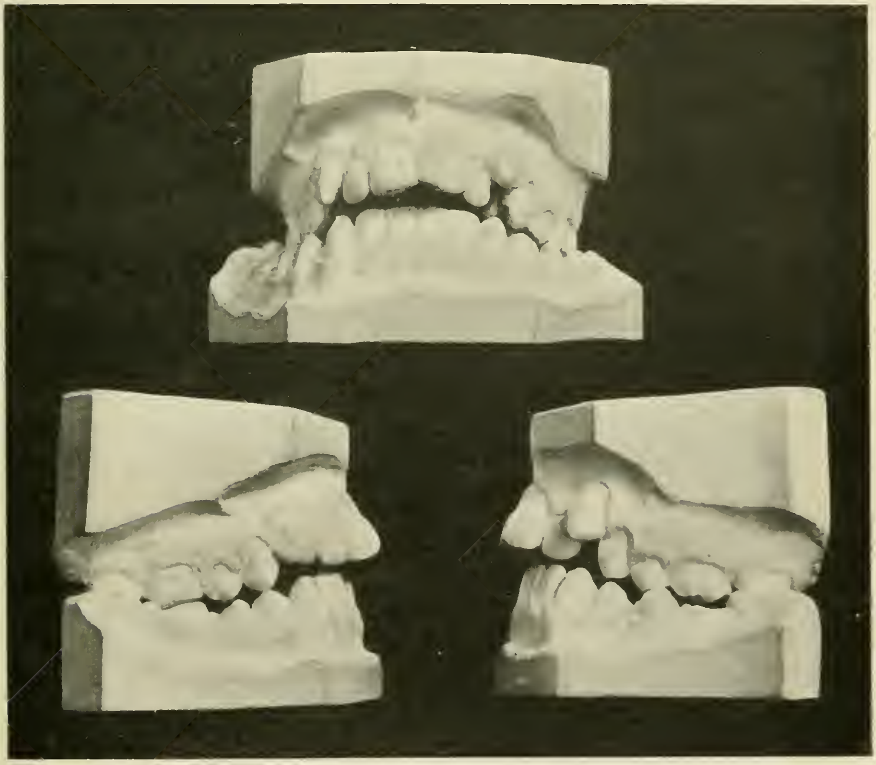


Fig. 24.

any individual movement of the teeth. The operation was finished in eighteen days, with the result shown in Figs. 7 and 8. Soon after retention the case was referred back to the rhinologist, and he reported that the deflection in the septum had disappeared. Radiographs of the palate are shown in Fig. 9, before and after treatment. The one taken before is not very clear, as it was nearly impossible to keep the child's head still. However, it shows the position of the permanent incisors clearly enough to compare their places before and after the operation.

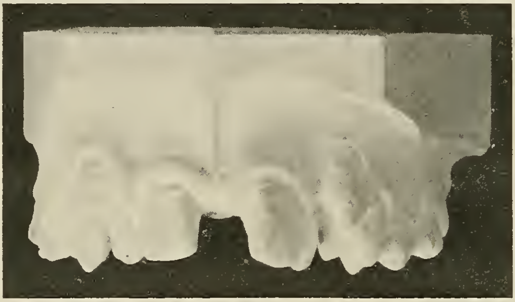


Fig. 25.

This case proceeded a little faster than the first, though the nuts were only turned once a day. Very little soreness or pain developed. So far as I could observe, it was much less painful than in the case of teeth moved by the ordinary method. The retention was kept in place three months, and after a year the teeth remained in the same positions.

From the time of these first two operations to the present, I have used this method in fifteen cases. The limits of this paper will not permit of describing all of them, but I will present a number that show most marked maxillary movement, and which offer the clearest evidence bearing on the question of what takes place in the vault of the mouth during this kind of treatment.

Case III.

Fig. 10 shows the models before treatment of a boy eleven years old. Fig. 11, the palatal view of the upper arch, before and during the treatment. I thought that if I could open this arch through the center, and then draw the left lateral into the space, it would simplify the treatment very much. A space of thirty-four-hundredths of an inch was opened in forty-two days, or six weeks' time. The space gained between the molars was also thirty-four-hundredths, showing uniform widening along the whole arch. Fig. 12 shows the appearance of the anterior teeth while the work was in progress. After the space was obtained the left central was moved

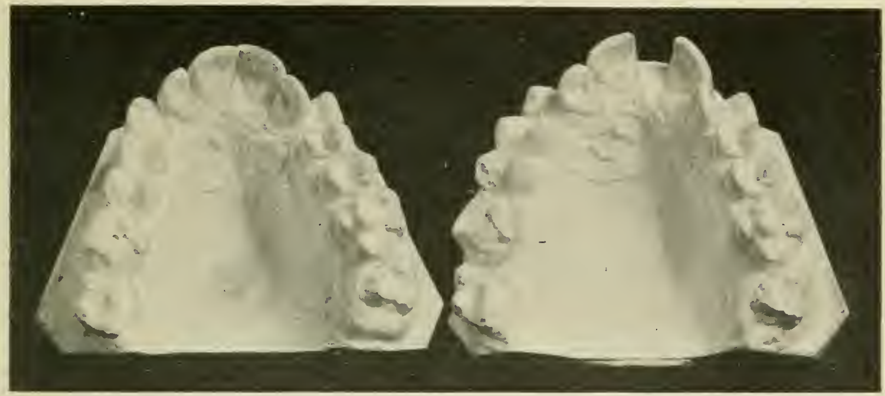


Fig. 26.

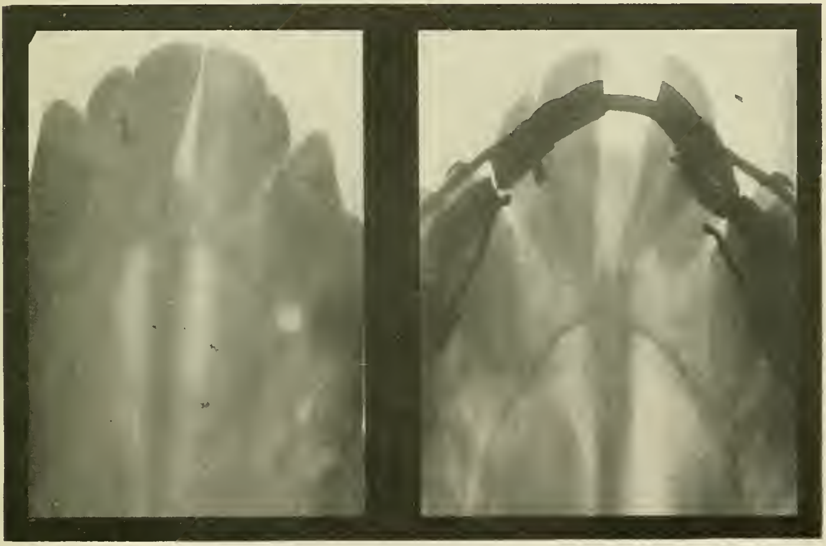


Fig. 27.

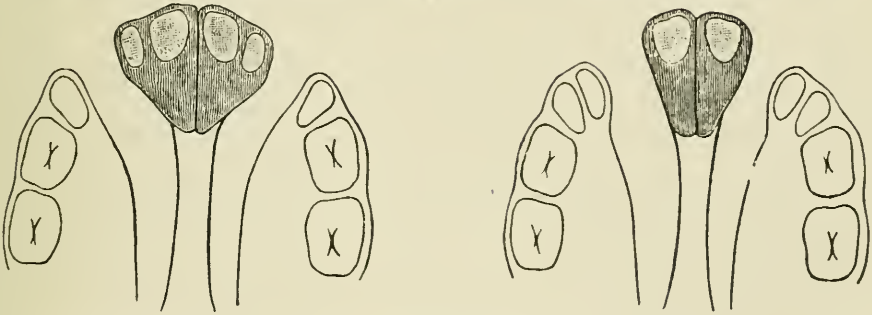


Fig. 28.

over into the space, then a plain arch substituted, and the laterals turned into position. Fig. 13 shows the radiograph of the palate after treatment.

Case IV. Fig. 14 shows radiographs both before and after treatment. Patient, girl eight years of age. In this case the time of treatment was about four months. The arch was widened about twenty-five-hundredths of an inch. There seems to be a redistribution of bone on both sides of the suture.

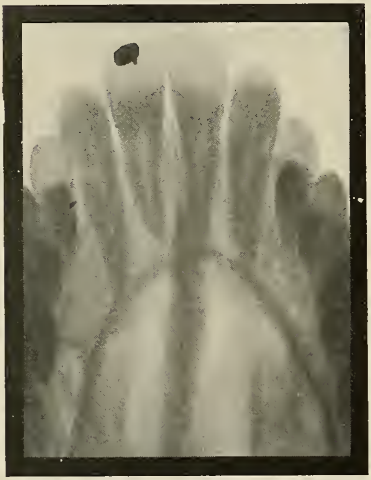


Fig. 29.

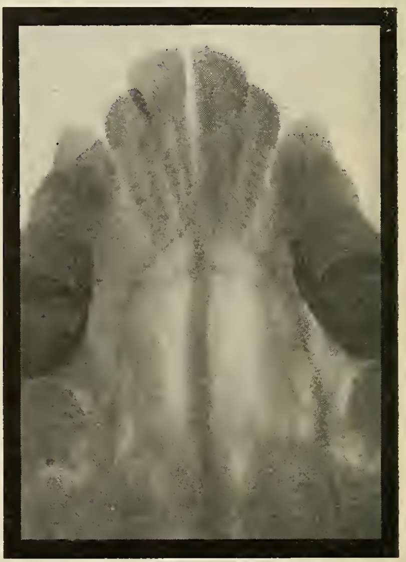


Fig. 30.

Case V. Fig. 15 shows models of a boy of nine before treatment. In this case a slightly different course was pursued. The central incisors were drawn together and retained in the first few weeks. The lingual wire was fastened to the deciduous cuspid. The device to prevent the molars from tipping was changed first to the Ainsworth perpendicular tube, then later in the treatment to the device shown previously in the illustration of the apparatus. This device is better illustrated in Fig. 16, and I may say that I like it better than any other I have tried. The final occlusion of this case is shown in Fig. 17. Width gained across the molars was twelve-hundredths. Time of treatment about four months. Fig. 18 shows occlusal views of models before and after treatment, and Fig. 19 the radiographs.

Case VI. Fig. 20 shows models of a boy four and one-half years old, with lingual occlusion on the left side. Bands were placed on the centrals and the space produced in the center. No attempt was made to hurry the movement. During the first three weeks the nuts were turned only twice a week, and the appliance was in the mouth about two months. The movement was very easy, and the father wrote me at the conclusion that the boy was sincerely sorry that he could not go on with his visits to the office. Fig. 21 shows the models of the completed case, and Fig. 22 the palatine views before and after treatment. Fig. 23, radiographs before and after treatment.

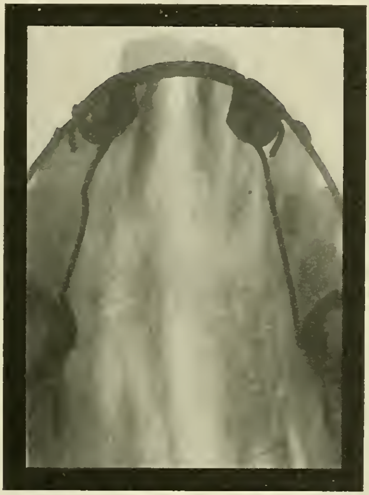
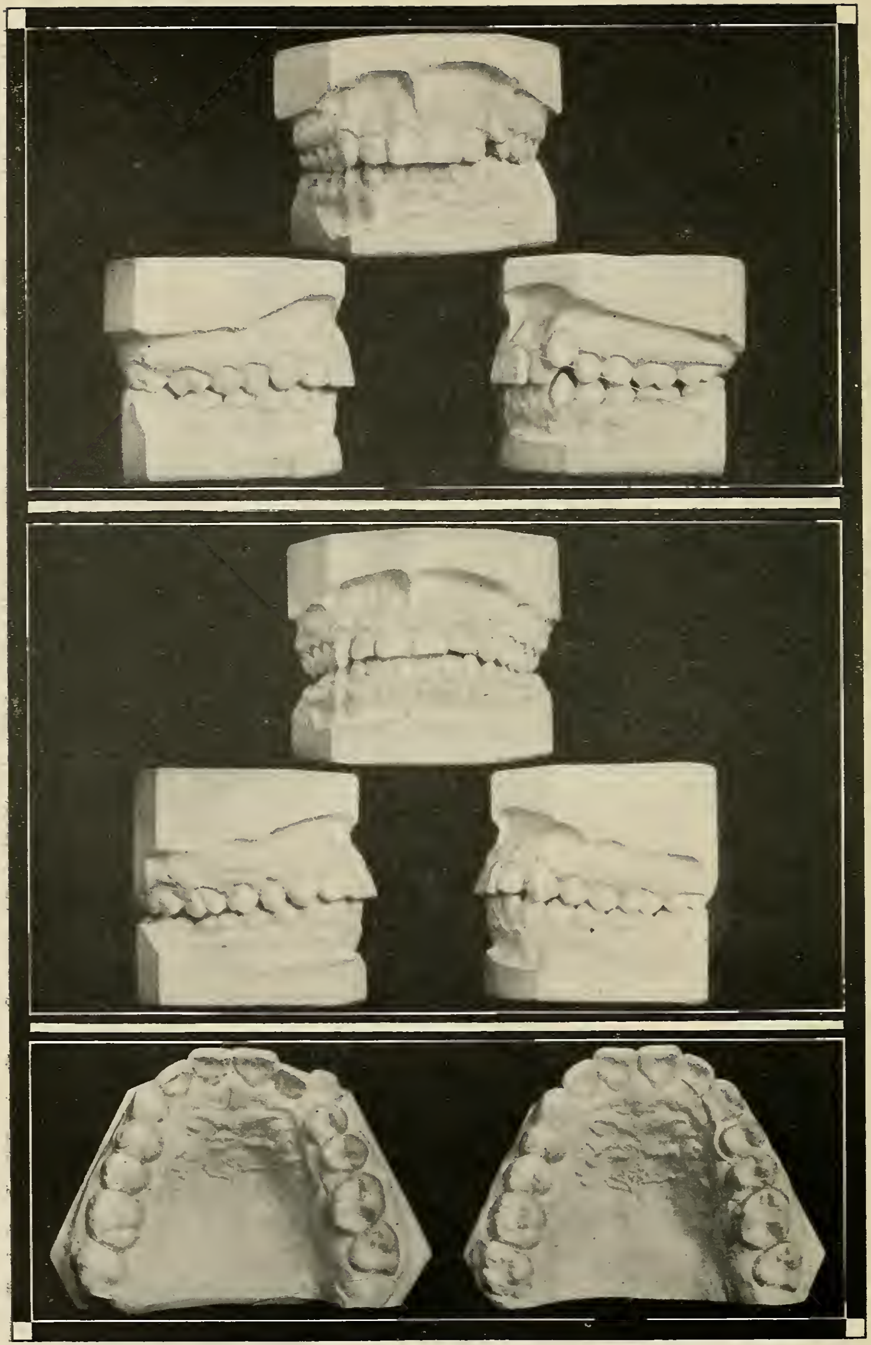


Fig. 31.

Case VII. The next case is a young man sixteen years of age. Fig. 24 shows models before treatment. In this case lingual wires were used, extending past the first bicuspids, and ligated in front of them through to the arch. The centrals were banded and ligated from the usual points of the arch, their upper distal surface. Rapid movement was not especially attempted, and space between centrals was produced in four weeks. Fig. 25 shows the appearance of the upper model after treatment, and Fig. 26 appearance of the palatine surfaces of the models before and after treatment. Fig. 27 shows radiographs of palate both before and after treatment. In this case the molars showed more than usual resistance to moving. After a week or two a jack screw was therefore placed across the vault of the mouth resting on the lingual wires in the embrasures between the first



Figs. 32, 33 and 34.

molar and second bicuspid. This jack screw was kept in place about one week. The amount of movement across the cuspids was twenty-two-hundredths of an inch, and the space between the incisors twenty-five-hundredths. No attachment whatever was made to the cuspids. The appearance of the movement was such that if separation of the suture ever occurs I would expect it in this case, yet the radiograph does not seem to disclose it.

In studying the action of the appliance and the radiographs in this series of cases, I can see no evidence that the suture has in any case been opened. It, therefore, is evident that the appearance of a space between the central incisors, either when force is applied to them, or when they are left free, is not necessarily evidence that the maxillary suture has been opened. As against the negative evidence in the radiographs, we have only the testimony offered by Dr. Ottolengui that in one of his cases a needle could be easily passed through the center of the mouth into the nasal space, and the experiments of Dr. Brown on skulls. In order that the operations on dry or macerated skulls should be conclusive evidence, it must be assumed that the tissues holding the two halves of the maxilla together are as resistant to separation in the dry or macerated skull as in the living human being. This is problematical.

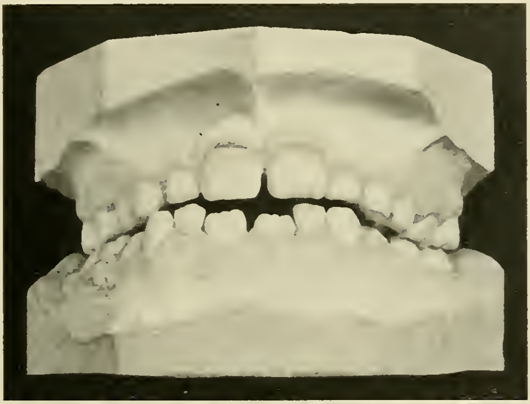


Fig. 35.

Author's Views.

What seems to take place is the stretching of the thin plates of the palate between the reinforced portion along the suture and the thick alveolar structure surrounding the teeth. Practically all the radiographs of the palate show this portion to be thin, and the radiographs after treatment give evidence of the stretching and rearrangement of the bone in that region.

That this line is the line of least resistance is indicated by the fact that cleft palate appears along this portion of the palate. In Fig. 28 we have the illustrations of Kölliker and Albrecht (Gray's Anatomy) showing the lines of separation of cleft palate.

In Figs. 29, 30 and 31 we have radiographs of the palate showing that along these lines the bone is thinnest. The lack of soreness or tipping of the teeth is further evidence of movement of the halves of the maxilla. The value of this movement is not greatly affected by the consideration of whether the suture is opened or the movement occurs by stretching on either side except in the bearing it has on the adjustment and management of the appliances.

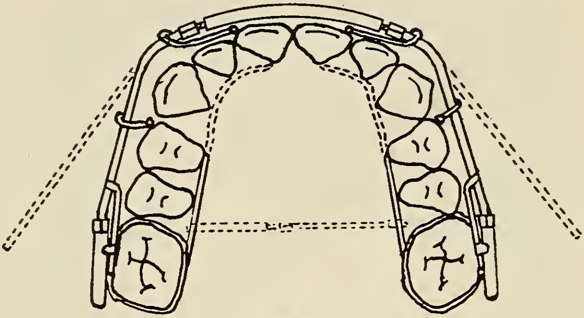


Fig. 36.

When force of the character previously described is exerted, the movement will take place in the line of least resistance, and the anatomical structure indicates the portion on either side of the suture as that line. It has been pointed out that this space does not always occur between the centrals, but sometimes appears between the laterals and centrals or laterals and cuspids. This has been observed by Dr. Brown and others. Supposing the force to be equally exerted from either side as in the jack screw across the mouth, acting on the bridge of bony tissues holding the incisor teeth, these dividing forces would naturally meet in the center and thus space would most often occur between the centrals. In experimenting I have found that this space can be produced at any point desired, yet most easily between the centrals.

Case VIII.

There is another kind of movement that I have observed in a number of cases that I have not been able to explain except on the supposition that the whole half of the maxilla can be moved. Of these cases I will show one as an example. The models before treatment are shown in Fig. 32. The bicuspids and molars on the left side have apparently moved forward, and

I wished to move them back. I put on the regular expansion arches with bands on the first molars, and provided for intermaxillary rubbers on the left side. I expected to wedge back the second molar a short distance, and then move the first back to take up the space, continuing this process until I produced a sufficient space between the molars and second bicuspid, next to move that back and then the first. I worked for a couple of months without being able to produce any space between the second bicuspid and molar, and the case began to give me great anxiety when one morning I discovered that considerable space was appearing between lateral and cuspid. I had banded the cuspid with a hook at the gingival line, and had ligated it down to the arch, so that the downward pull of the intermaxillaries was taken up by the cuspid, thus tending to wedge it against the first bicuspid.

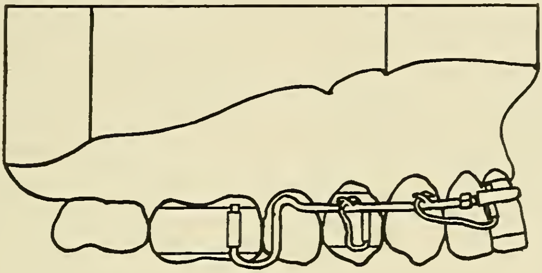


Fig. 37.

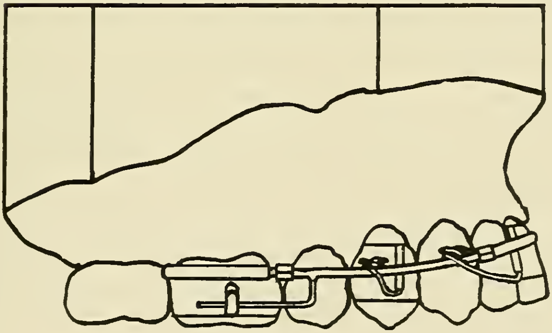


Fig. 38.

I at once abandoned the effort to produce space between any other teeth, and the molars and bicuspids seemed to move back bodily and the cuspid came down into place. The completed models are shown in Fig 33 and the occlusal view in Fig. 34.

Appliance Used.

In regard to the appliance I have used for this purpose, while not perfect it has some advantages over any others I have seen recommended. It obviates the necessity of using anything across the mouth, the advantage of which is very great.

In some cases, however, the anterior separation is faster and easier than the posterior, and I have found it of advantage in such cases to utilize a jack screw across the mouth for a few days. The construction of the appliance is such that this is easily done, and it can be removed and inserted as required. The device for preventing the tipping of the molars should be as positive as possible, and the anchorage in the region of the cuspid should be of this character. While there is no question that maxillary movement can be accomplished without these devices for preventing the tipping of the teeth, yet I am convinced that they make the movement much more certain and accurate.

Effect on Nasal Space.

As to the comparative value of maxillary movement in its relation to the opening of the nasal passages, while it is no doubt true that much more time and wider observation are needed to correctly estimate its effect, yet it seems reasonable, as claimed by Dr. Faught, that this movement acts much more accurately and definitely to increase the nasal space. In the majority of the cases where I have used this method, I have noticed a quicker and more definite improvement in breathing than where I have tipped the teeth outward, as in the usual movement with the simple expansion arch. The disappearance of the deflection of the septum in the second case reported is very significant evidence of immediate opening of the nasal space.

The question will naturally arise as to whether there is any danger to the permanent incisor teeth in opening this space, and whether they will afterward erupt to their normal positions. The only evidence I have on this point is this model Fig. 35 of the first case reported. These models were made one year after the retention was removed.

I think it has become evident to all who have watched the movement and retention of teeth over a period of years, that the movement of teeth by tipping the crowns is not the most desirable method of movement. This method has been used with the supposition that the natural forces of mastication or the growth of the bones through stimulation during movement, or both, will, in a few years, straighten up the teeth, the crowns remaining in their new positions, and it is only upon such supposition that this kind of movement can be tolerated. Yet, while we must all admit that this desired result does obtain in some fortunate cases, it is not at all reliable and no retention, especially of the molars and bicuspids, can be trusted until the teeth have assumed, or have been placed, in their upright positions with their buccal cusps interlocked. Where maxillary movement is successfully accomplished there is no tipping of the teeth, and the effect will undoubtedly be to greatly shorten and simplify the retention.

One of the most beneficial effects of the widening of the dental arch in orthodontic treatment has been found to be the improvement in the condition of the nasal passages. The importance of this improvement of the breathing capacity should lead us to widen the dental arch as far as possible within certain well-defined limits. In movement with the ordinary expansion arch with the regular smooth round tubes, one limit to the amount of the expansion is found in the extent to which it is wise to tip the molar teeth outward without danger of their remaining in this position. The movement of the maxillary bones would remove this restriction. The restriction set by nature on expanding the arch is made by the size and character of the teeth. In no case should they be carried beyond the point where they will form the normal arch, and rest with perfect contact points.

The question will naturally arise as to whether this movement "can be carried to an extent that will cover all requirements in the necessary widening of arches?" I have easily obtained thirty-four-hundredths of an inch both in the molar and incisal region, and I feel sure that this will cover the requirements of the great majority of the cases presented for treatment.

In the treatment of children this method of operation presents great advantages. While the appearance of some forms of malocclusion in children under eight years of age makes the wearing of appliances for a long period of time justifiable, yet it is not desirable. Any method that will accomplish results in a shorter time without the risk of breaking up the habits of mastication will be very beneficial. The forms of malocclusion that we treat most at that period are mesial or distal occlusion and general lack of development, sometimes shown, as in some of the cases I have presented by lingual occlusion of the upper molars.

In mesial or distal occlusion there is present lack of harmony in the sizes of the lower and upper arches. If this is corrected the mesial or distal occlusion at this age will generally disappear or be remedied very easily. In almost every case we must harmonize the arches by expanding the upper arch, not by contracting the lower. If we can widen this arch in two or three weeks by maxillary movement I think we will have done a much better operation than can possibly be done by any other method, provided there are no bad results in the movement; and none so far have appeared.

In cases of general lack of development with lingual occlusion of the molars, normal conditions were established in much less time and with far less discomfort than by any other method I have ever used. So far as I have observed, very little or no lateral growth is showing in the children that come under our treatment at the present time. The growth spaces that are supposed to appear do not come. Growth spaces, when they do come, only appear between the anterior teeth, and are probably caused by the spreading of the two halves of the premaxilla in the normal stimulation of severe mastication. If these spaces are not apparent at the age of five, we may be sure that there will be malocclusion. If we can spread the maxillæ in a few weeks, artificially producing this growth, is that not the best treatment of the case that can be followed?

Appendix.

The following three illustrations are added to the paper to make more clear the application of the divided expansion arch to produce maxillary movement. Fig. 36 shows the position of the lingual wires which, as shown by the dotted lines, may be extended to the cuspids, laterals or centrals, as desired. The possibility of placing a jack-screw across the arch for a few days, or a week, to hasten the movement, is indicated similarly.

The arch should be not less than 16 gauge, and should fit the front tube very tightly. An oval or flat tube is best to prevent turning. These cuts show small vertical tubes on the centrals and laterals and first bicuspids, with 20-gauge gold wire bent over the arch instead of ligatures.

Figs. 37 and 38 show different devices on the molars to prevent tipping. With this adjustment of the divided arch the work can be carried on slowly or very rapidly with a minimum amount of inconvenience to the patient.

Chevalier Q. Jackson, M.D., Pittsburg, Pa., delivered a most interesting and instructive lecture upon the subject of Bronchoscopy and Esophagoscopy, illustrated with the lantern, which, unfortunately, we are unable to include in the transactions. Dr. Jackson spoke extemporaneously, and the regular stenographer of the Society being absent, the stenographic report submitted did not, in the opinion of the Board of Censors, adequately report Dr. Jackson's lecture. The following extract, however, will be of especial interest to Orthodontists, particularly in connection with the taking of impressions.

Lecture by Chevalier Q. Jackson, M.D.

In regard to what to do should anything drop into the pharynx. The first warning is, do not reach down for it with your finger; the chances are that you will make the patient gag and it will go on down, or the finger will push it down into the trachea and possibly into the larynx. The best way is to use the little forceps (of which I have many painful recollections in the dental chair) with which you put absorbent materials into the teeth, and take out the thing. Should it escape, do not reach down.

The second warning is, do not take it for granted that it will pass down: it may; but do not take it for granted; simply have the stools watched. It is necessary to have a radiograph, if it is dense to the ray, as it probably will be, the radiograph will show it. Do not use the fluoroscope, it will not show it, but take a radiograph.

The third warning is, do not allow anyone to attempt to remove it, or to force it down by blind methods. There are men in every city who can do the work, but the general practitioner is totally unaware that there are any such procedures as bronchoscopy and esophagoscopy. If the foreign body passes into the stomach, do not administer a cathartic; give bulky foods. It is far better to embed it in bulky food and allow it to pass off, as it will not abrase the mucosa.

Foreign bodies may be discovered in the intestines. If the foreign body *keeps moving*, it is perfectly safe in the stomach and in the intestines. It is safe for a long time, but if it should lodge in one position for four or five days it is almost sure to produce an abscess and cause death, as in this case (showing lantern slide). This reached the intestines and remained one week in one position. I begged the parent to allow a general surgeon to do an abdominal section, but they refused, and the child died. Remember, then, that if anything does get down into the stomach, it is all right as long as it keeps moving.

Items of Interest

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THE AMERICAN SOCIETY OF ORTHODONTISTS

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TWELFTH ANNUAL MEETING
HELD AT
CHICAGO, ILL., JULY 1st, 2nd, 3rd,
NINETEEN HUNDRED TWELVE

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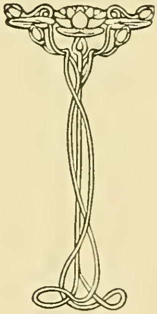

TWELFTH ANNUAL MEETING
HELD AT
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NINETEEN HUNDRED TWELVE

Dates and Places of Meetings of The American Society of Orthodontists.

First Annual Meeting held at St. Louis, Mo., June 11, 12 and 13, 1901.

Second Annual Meeting held at Philadelphia, Pa., October 8, 9 and 10, 1902.

Third Annual Meeting held at Buffalo, N. Y., December 31, 1903; January 1 and 2, 1904.

Fourth Annual Meeting held at St. Louis, Mo., August 29, 1904. At this meeting only routine business of the Society was transacted. There being no other program the proceedings were not published.

Fifth Annual Meeting held at Chicago, Ill., September 29, 30, and October 1, 1905.

Sixth Annual Meeting held at New York City, December 27, 28 and 29, 1906.

Seventh Annual Meeting held at Detroit, Mich., October 2, 3 and 4, 1907.

Eighth Annual Meeting held at Washington, D. C., November 5, 6 and 7, 1908.

Ninth Annual Meeting held at Cleveland, Ohio, October 4, 5 and 6, 1909.

Tenth Annual Meeting held at Denver, Colo., July 13, 14 and 15, 1910.

Eleventh Annual Meeting held at Boston, Mass., September 20, 21, 22, 23, 1911.

Twelfth Annual Meeting held at Chicago, Ill., July 1, 2 and 3, 1912.

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Dr. H. D. Keeler....521 Fleming Bldg., Des Moines, Iowa.
Dr. Frederick C. Kemple...576 Fifth Ave., New York City.
Dr. A. H. Ketcham.........724 Mack Bldg., Denver, Colo.
Dr. Addison Kingsbury..185 East State St., Columbus, Ohio.

Dr. William G. Law . . . In den Zelten 18 A, Berlin, Germany.

Dr. B. E. Lischer . . . 511 Wall Bldg., N. W. corner Olive St. and Vanderventer Ave., St. Louis, Mo.

Dr. James D. Locke . . 702 Ashton Bldg., Grand Rapids, Mich.

Dr. Lloyd S. Lourie . . . . 92 State St., Chicago, Ill.

Dr. Axel Lundstrom . . Riddaregatan 7, Stockholm, Sweden.

Dr. H. L. Morehouse . . . 1002 Paulson Bldg., Spokane, Wash.

Dr. James B. Morrison . . . . . . Birks Bldg., Montreal, Quebec.

Dr. James D. McCoy . . . . 708 Walter P. Story Bldg., Los Angeles, Cal.

Dr. J. J. McMullen . . . . . 612 N. Y. Life Bldg., Omaha, Neb.

Dr. Frederick S. McKay . . . . Colorado Springs, Colo.

Dr. Grafton Munroe . . . . Springfield, Ill.

Dr. F. W. MacDonald . . 271 Woodward Ave., Detroit, Mich.

Dr. E. L. Mitchell . . . 316 Pennway Bldg., Indianapolis, Ind.

Dr. R. Ottolengui . . . . 80 West 40th St., New York City.

Dr. H. A. Pullen . . . . 131 Allen St., Buffalo, N. Y.

Dr. Ralph N. Pullen, 332 Metropolitan Bldg., Denver, Colo.

Dr. Paul Prewitt, 407 City Nat'l Bank Bldg., Lexington, Ky.

Dr. Norman G. Reoch . . . . . . 419 Boylston St., Boston, Mass.

Dr. A. P. Rogers . . . . 154 Newbury St., Boston, Mass.

Dr. José J. Rojo . . . . Ave. San Francisco No. 52, Mexico City, Mexico.

Dr. J. B. Stewart . . . . 25 Groton Bldg., Cincinnati, Ohio.

Dr. Allen H. Suggett . . . . Butler Bldg., Union Sq., San Francisco, Cal.

Dr. Richard Summa . . 410 Metropolitan Bldg., St. Louis, Mo.

Dr. Frank E. Shelden . . 418 Bryant Bldg., Kansas City, Mo.

Dr. William C. Smith . . . . 545 Chamber of Commerce, Pasadena, Cal.

Dr. Herbert W. Taylor . . 58 West 50th St., New York City.

Dr. Charles R. Turner . . . 1500 Locust St., Philadelphia, Pa.

Dr. Hubert C. Visick........39 Brooke St., Grosvenor Sq.,
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Dr. Milton T. Watson..270 Woodward Ave., Detroit, Mich.

Dr. S. Merrill Weeks....1429 Spruce St., Philadelphia, Pa.

Dr. C. W. B. Wheeler....17 East 38th St., New York City.

Dr. O. W. White.......406 Fine Arts Bldg., Detroit, Mich.

Dr. Raymond C. Willett....512 Jefferson Bldg., Peoria, Ill.

Dr. Ralph Waldron..........549 High St., Newark, N. J.

Dr. J. Lowe Young........576 Fifth Ave., New York City.

Honorary Members of The American Society of Orthodontists.

Dr. Henry Baker.........157 Newbury St., Boston, Mass.

Dr. I. Norman Broomell...........635 Real Estate Bldg.,
Philadelphia, Pa.

Dr. M. H. Cryer....Dental Dep't U. of P., Philadelphia, Pa.

Dr. Clarence J. Grieves........Park Ave. and Madison St.,
Baltimore, Md.

Dr. C. Van der Hoven...........The Hague, Netherlands.

Dr. A. A. Hamer.................Amsterdam, Netherlands.

Dr. Frank B. Noyes.............92 State St., Chicago, Ill.

Dr. Booth Pearsall, 97 Pinchely Road, London, N. W., Eng.

Dr. C. Witthaus....Nordblack 79, Rotterdam, Netherlands.

Prof. Edmund H. Wuerpel...............St. Louis, Mo.

Dr. H. P. Mosher...........828 Beacon St., Boston, Mass.

Dr. G. M. Wright........................Denver, Colo.

President's Address.

By Milton T. Watson, D.D.S.

To the Members of the American Society of Orthodontists:

It is with a feeling of mingled joy and regret that I come before you this morning. The joy is partially from gratitude at the confidence you have shown in me by the manner of electing me to the presidency for a second time, and in no small way to the fact that our Board of Censors has done such excellent and faithful work in preparation for this meeting. My regret is that I have personally been able to do so little toward bringing about this fine program, which I think has never been surpassed.

It is not my purpose to detain you in any lengthy discussion, but there are a few things that I believe this society has done exceedingly well, and there are some which I believe can be improved upon; all of which can be mentioned briefly with profit.

I remember very keenly the high ideals, the unanimity of purpose, and incidently, the anxiety that was felt when plans were perfected for the organization of this society. All of you who are familiar with the early activities of this pioneer organization will, I am sure, agree with me when I say that the most conspicuous feature of our activities at that time was an earnest desire to gain a greater knowledge. We exchanged experiences, sought advice and counseled with each other, in true brotherly fashion; always with a due and proper regard for one, at least, of the distinguishing marks of the true professional man, namely, a really earnest desire to help others in our chosen field of labor. Those were happy days —simple, happy days. There was, so far as I know, no jealousy among us, but abundant good will, and a very evident desire that the men best qualified to perform a certain task or duty should be the ones selected. Do you wonder, gentlemen, that with such co-operation, this society made a name for itself, rapidly and without any resort to publicity methods, other than the publication of its transactions?

Publication.

Without wish or intent to detract from the honor due to individuals, I believe I am not in any way overstating the facts when I say that the method of publishing its transactions, employed by this society, has done more to show the profession at large the need for, and the far-reaching influences of, orthodontic interference, than all other influences combined, with the possible exception of the important educational work that is being quite

Reprint from Items of Interest

generally done now in dental colleges, and this, of course, has been operative for only a comparatively short time, and effects only the graduates of recent years.

Dissensions Unnecessary.

I almost hesitate to mention another and later truth in connection with this society, and yet if we are really men, we should be willing to either defend our past actions, as individuals, or see the error of our ways and improve. You all know that during recent years more or less antagonism has been in evidence among orthodontists; resignations from this society were filed in a few cases, and a new "house of worship" erected. Such methods are not conducive to the most desirable results, and they have served the unfortunate purpose of dividing the working force in orthodontia, which was barely old enough to stand alone anyway, thus hampering the development of the art, as well as bringing about strained relations between men who, so far as I know, really have no actual serious grievance, and who would, I believe, positively be embarrassed to go before a disinterested judge and state their case. Such actions and such an attitude are unbecoming to men who in so many ways entertain high standards of conduct.

I shall pursue this subject only long enough to ask who are responsible? Why do not these men forget their petty personal interests and meet as men, in an endeavor to clear away this cloud, which is a disgrace as well as a blight upon a young and important specialty? I believe our duty is clear; in fact, that it is a positive obligation, but that a false pride is standing in the way, and therefore as your chief executive, I take it upon myself to run the risk of having our action misconstrued, and say to all men *truly* interested in the science and art of orthodontia: We are ready to meet you on an equal footing—to join hands with you in any work that will tend to clear up the many unsolved, and only partially solved, problems confronting us. Years of experience and observation have induced us to accept certain apparent truths as fundamental, yet even these you are at liberty to assail from a *purely scientific* point of view, but communications teeming with bitter personal attacks, even though delicately veiled, will receive scant welcome. A conspicuous feature of our transactions has been the almost universal attempt of essayists to give credit honestly and generously to all to whom credit is due, and whenever anyone has become personal or vindictive, someone has invariably suggested, though often in a subtle way, that such methods are unwelcome. Show us a broader, better way of conducting the affairs of a society devoted to the gathering and distributing of scientific information, and you will find us open to conviction.

I believe our true purpose is made sufficiently clear by the foregoing. so that no one can mistake our meaning, but if a more concrete statement is desirable, let me put it thus: We want the sympathy, friendship and co-operation of everyone who is truly interested in the advancement of orthodontia. Our purpose is not, however, to advance the personal interests of any individual. If these plans appeal to you as being consistent with personal freedom, and a high professional ambition, let me extend to every man, eligible to membership, a cordial invitation to join us, which will in no way interfere with your membership in other societies, nor your personal liberty, so long as you maintain a strictly ethical standard.

Fund for Research Work.

When we review briefly the work of this society for the past ten or twelve years, especially in relation to the appliance problem, the question of retention, and the distribution of information regarding the wisdom of early treatment, we must all admit that it has been an important factor, and is second only as a source of information to the work accomplished by the Angle Post Graduate School, with which it is, of course, in no sense a competitor, for each is doing a distinctive and important work. This brings me to the point of suggesting a plan which has often been spoken of, but never fully executed, which I am sure will meet with your complete approval, namely, that of providing a fund to cover the laboratory expenses, at least, of all research work that is conducted with the approval of the Board of Censors; the first reports, of course, to be made to this society. There are only a few men who are naturally qualified to undertake work of this sort, and they should be encouraged, not only by being relieved of a share, at least, of the expense, but either by the Board of Censors or a special committee, appointed expressly for the purpose, doing everything possible to assist the worker in this field.

The present interest in the question of opening the intermaxillary suture is an example of the need for stimulating work of this sort. Practically nothing has been done yet to determine positively whether the suture can be opened at will, and absolutely nothing, so far as I know, to determine the nature of the subsequent changes, if it ever is actually opened throughout its entire length. The work done by various men so far is only preliminary, and final proofs have been entirely lacking, notwithstanding the fact that some of the more enthusiastic do not concede this. As a matter of fact, we do not even know but that the pressure against the teeth, which would be necessary to hold an opened suture apart, might result finally in exactly the same condition that would have resulted from moving the teeth in the first place, namely, the gradual widening of the dental arch through this pressure that is brought to bear against the teeth, in the effort of the displaced bones to return to their original position, thus allowing the suture to reclose.

I am exceedingly interested in the work that Doctor Dewey has been doing in connection with this question, and hope he may be encouraged to continue it, and that this society will see fit not only to take care of any future expense, but of the actual expense already involved. Work of this nature is of such inestimable value to us all that we must each do our share toward helping to solve the problem, and about all that most of us are capable of doing, in this connection, is to contribute toward a fund which will be sufficient to carry this work on in a thoroughly complete and scientific manner. I should also like to see this society reimburse Doctor Lawrence Baker for his expenses in connection with his experimental work for his paper presented at this meeting.

Restricted Membership.

There has been much discussion before this society in recent years regarding the actual wisdom of a plan that was adopted at my suggestion some ten years ago, restricting our membership to exclusive specialists and teachers. This recommendation was made only after serious discussion with different men, but nevertheless I now believe that such a plan limits our usefulness. There can, I think, be no doubt of the prudence of eliminating the so-called "professional joiner," and the type of man who loves to make himself conspicuous by just talking whenever and wherever there is an opportunity. There is, however, in my opinion at least, some injustice in making all teachers eligible, and refusing membership to some few men who have spent much more time and effort in preparation, but who are nevertheless spending a part of their time in kindred work.

We know, of course, that there are some professional societies that limit their membership to a very small number of men. There are also some societies that require a certain number of years spent in the exclusive practice of their particular specialty, and that an essay, acceptable to a committee appointed to consider it, shall be presented with the application for membership. The question is, are such drastic measures really an assurance that only papers and discussions of the highest scientific value will be presented? I think not, for we all know that five years' exclusive practice. for instance, would come far short of making some men valuable acquisitions, even though by some means they were able to present an essay of sufficient merit to gain for them the coveted membership. I can also conceive of a man of broad scientific attainment, reached through years of diligent study and research, finally taking up a specialty and becoming at once a more learned and profound thinker than many of the oldest members in a society to which he would naturally like to belong.

How perfectly absurd and even disgusting such restrictions, as those mentioned above, would then appear. It is also, doubtless, the experience of most of us to have seen or known men who have done something very creditable on one occasion, do something ill-timed, ill-advised and erratic at some subsequent time.

If the above assertions are correct, then it would seem a difficult matter to make up a membership for any society, entirely of men and women, who will at all times measure up to the highest standard; in fact, I believe it to be almost, if not quite, beyond the range of human possibilities, and I therefore suggest that we adopt a policy of greater usefulness to a greater number and add an associate membership; this associate membership to be open to any one who is actually devoting a part of his time to orthodontia, and who is sufficiently interested in the subject to desire to meet with us, and willing to pay our annual dues, which shall be the same as for full membership. These members should, I believe, enjoy full privileges, but should not be eligible to hold office.

If it is deemed wise, let all applications for associate membership receive special consideration at the hands of the Board of Censors before being presented to the society for action. My purpose, as you must surely see, is not to increase our membership but our usefulness, for there are comparatively few men to whom such a membership would appeal, but I believe these few especially need this society.

Report of Failures.

That we may add still further to our usefulness, I suggest that some means be devised to bring about a much freer discussion of the problems we meet with in daily practice, especially our actual failures. I am not prepared to say just how this can be brought about with the greatest degree of success, though an hour or two set aside expressly for the report of cases that have been failures, would, I believe, be productive of a vast amount of good. I should, at least, like to see the new Board of Censors make an effort to bring about such a discussion at our next meeting.

As a final admonition, let me urge upon you, both as a society and as individuals, the wisdom of a greater charity towards those who happen to see things in a little different light, for we must not forget that time is an important element in determining all things, and that truth will eventually prevail.

Discussion of Dr. Watson's Address.

Dr. B. Frank Gray, Los Angeles.

I think the first impression that came to me in reading the address of the President was that his very genial personality shone out through every paragraph In fact, it was just about the sort of address I would expect from Dr. Watson, who never does anything by halves. I feel sure he has painted an accurate picture of the conditions existing at the time of the organization of the American Society of Orthodontists. The formation of another orthodontia society was doubtless one of those things the wisdom of which becomes a matter of varying opinions; still I think it will be well to look upon it as an important incident in the course of the development of our science. Doubtless it will all work out for the best interests of orthodontia. That there should be serious misunderstandings among men who are trying to advance the interests of orthodontia is unfortunate, especially when the element of personal bitterness creeps in. I feel that as time goes on these problems will find their solution. Personally, I have often wondered at the selfishness or, if you please, the jealousy that seems to attach itself to a personal opinion. We utter our conviction on a given point: our opinion is assailed by another. We at first defend our position because we believe we have uttered the truth. Let the controversy be prolonged and men are prone to permit the element of personality to enter, and, if care is not taken, the real issue becomes secondary in importance.

I do appreciate hearing Dr. Watson speak so strongly in favor of the Angle School of Orthodontia. Certainly it is, and has been for years, the backbone of this specialty. I can conceive of no school, post-graduate or otherwise, wherein the student could gain a like amount of practical knowledge and lasting enthusiasm. Dr. Angle is a power second to none in the orthodontic world, and I am always proud to say so, both to his friends and to his enemies.

I think the wisdom of Dr. Watson's suggestion as to an "associate membership" is open to serious question. In the conception of what constitutes orthodontia, it is truly remarkable what a gap there is between the real specialist and the average practitioner of dentistry who is simply interested in the subject as a side issue to his regular work. The question is, can the American Society of Orthodontists afford to extend membership privileges to the general practitioner in the hope of educating him in the practice of orthodontia? I feel that such a course would tend toward retrogression: that in the attempt to uplift those who might seek an associate membership, we would weaken our power for good, strong, progressive work of a really vital character. The tendency would be for men to use a membership in a society of specialists as a badge of efficiency in orthodontia. How this tendency might be overcome, I can scarcely see. Would it not be well to leave this particular field of work to those dental societies who wish to establish orthodontia study clubs or sections? I trust, in any event, that what is best will prevail. It must be borne in mind that each specialist in orthodontia still occupies a unique position: he exerts a peculiar influence, and it is important that that influence shall be cast in the right direction.

Dr. R. Ottolengui, New York City.

There are not a great many points in this address to discuss, because discussion should arise from some slight opposition, and I do not find myself in opposition to anything in the address. The most I can do will be to agree with the President, and to elaborate one or two of the ideas. I would call attention especially to the President's statement that it is unfortunate that there has been more or less estrangement between men who he believes would be embarrassed to go before a disinterested judge and state their case. Let us consider that statement for a minute.

In this country we have created a new art and science—the profession of dentistry. Out of that has grown this wonderful specialty of orthodontia which, largely through the influence, of course, of the graduates of the Angle School, has produced this society, which has attracted the attention of the entire scientific world, especially the medical and dental men, and yet, in the very brief history of this science as a separate specialty, we are already dividing up. Gentlemen, we are almost getting to be as bad as religious people who cannot worship in the same church, and yet who claim to be worshiping the same God. This is unfortunate, and as we have only one division, it seems to me the time is ripe now to close that division and work together. It cannot be true that any one body of men already has all the knowledge, or will obtain all the knowledge, and if we are going to share it, we should share it with one another; if we cannot do this for our own benefit, we should do it for the benefit of our patients. It seems to me a great pity. I have had mothers come in and ask me if a certain man was competent to do orthodontic work, and then tell me, "Well, I understand he is a member of such a society, and that he is not a member of the other society." I have had that happen in my office. The parents of patients have noticed this schism in our family, and it seems to me, and I say it frankly, if the other side will not make overtures to us, it would be becoming and broad-minded for this society to formulate a plan and ask for a reunion, because we should, in my opinion, be together.

In regard to the restriction of the society membership, I am again in an embarrassing position, because I got in before they shut the doors. I am not quite sure we would gain much by two kinds of membership. If I understand the President's address, and what he has said, and said truly, it may be we might let in under the rule some men who would be of no advantage to us, and we might keep out men who might be an actual advantage to us. We might help them and they might help us; nevertheless, I am opposed to associate membership in the society. I do not like men to be in the society who must feel they have not equal rights with other men in it. I would raise the bars a little higher for that kind of men and give them equal rights. I would rather see a general practitioner sufficiently interested in orthodontia permitted to come in under a unanimous vote than to curtail his rights when he gets in.

Lastly, I am more than delighted to hear the President make a request for reports in regard to failures, because I have found it difficult to hear of failures outside of my own office, and therefore I have hesitated to speak of my own. Yet I have difficulties I would gladly discuss because other men must have to contend with the same problems, the same difficulties. I will do as the President suggests, and say a few words about a particular kind of failure that has harassed me almost beyond endurance. Of course, it is quite possible that in a short time we will be able to abandon the use of ligatures, in which case I would not have the particular troubles of which I am about to speak, but it has been, up to now, or until recently, customary to use ligatures. These ligatures have been of two kinds: the wire ligature and the silk ligature, and I have had equal trouble with them. The position is this: we, as a society, rather favor fixed appliances instead of removable ones, I mean one that is removable at the will of the patient. The whole operation of regulating with the arch depends upon its ligation to the teeth, and if ligatures are removed our work is severely hindered, if, indeed, the patient is not injured.

Case I.

I had a boy under my care who never came back with everything in place. One of my bands would be broken at one time, and at another the wires would be off. I would repair them, and he would come back with the arch broken, etc., etc., etc. I finally became convinced that he was using his entire time between visits in undoing what I was doing. (Laughter.) Finally, he came in one day with his upper arch and one of the bands broken. I took everything off. I fitted new bands. I took an impression for a new appliance and made a new appliance for the upper arch, and he came in the next day with the lower arch all in pieces, and in his hand. I put the appliances back in the box, and wrote a note to his mother, stating that I was unwilling to continue with the case. That was a failure. I failed to manage that boy. There is no question about that, and, in a sense, while I felt I had a right to rid myself of him, still he had a lovely little brother with whom I could have done anything, but he is having his teeth regulated by another gentleman, who will make a success and get credit in that family and among their friends for doing good work where I had failed; thus the management of that kind of a patient is one of our serious problems.

Case II. Three other cases were girls. I had arranged to treat these patients on Tuesday afternoons, because they had that afternoon off, and I hated Tuesday afternoon for what it would bring me. The first of these girls, when I first took her, was about nine years of age, a very beautiful child, and the only child. By the way, it occurs to me that where we have to deal with the *only* child in a family we are entitled to a higher fee. This girl had one simple excuse for all her derelictions. I would say to her, "Why did you take that ligature off?" "Oh, well, you know I am so nervous." "You are not nervous when you are here." "No, but, doctor, hurry up; I have not time to wait; I have to go to the park." I would put everything on, and she would come in at the next visit with nothing on but the arches. After she got better acquainted with me, she would not even have the arches on. (Laughter.) I did not object so much to her taking the arches off, as they could be replaced. But she learned to replace the arches, and, being bent, she induced an expansive force, which gradually moved the molars out of alignment. In this particular case the work should have been finished in eighteen months, but instead it has dragged along for over three years, until this winter I notified the parents around Christmas time that the child's teeth were a little worse at Christmas than they had been in September on account of her interference, and that I would not be responsible for the result, and would not care to go on with the case after the first of July. After that she kept one or two ligatures on. I hated to think of making an absolute failure in this case, so I sent for the mother. I said to her, "As I wrote you before, I am leaving town on the first of July; I am not going to take this case up next year, but I will do the best I can, and would like to have the child come in *every day*." By having the child come in every day I gradually got some of the teeth into fair position, and when I found a tooth in position I would put a retainer on that one tooth to hold it. I have obtained a fair result, considering the obstacles that were in my way, but the result is one that might be criticized as a failure by every man in this room, if he could compare the original models with the present condition. It did not look like a difficult case, yet I have given three years' service to obtain a mediocre result.

Case III. The second girl was exactly the reverse in temperament, perfectly phlegmatic, never speaking from the time she sat down, making no resistance to anything I did. She would smile, and say "Good-bye," and come back with nothing in place. (Laughter.) I asked her why she removed the ligatures, and she had no explanation. She was cutting the silk ligatures, and I finally discovered that she was doing so with her finger nails. So I trimmed her finger nails, and found she could get rid of them in some other way. Then I used wires. It did not make any difference. Eventually I notified the parents of this child that she would have to come in every day for six weeks before I left town, and that that would be all I could do, and I received a letter from the parents saying that it would be satisfactory. I finished up as best I could, and sent my bill for the balance of the fee, and in the autumn the mother came in and said: "Doctor, are you proud of that result?" I said, "No." The mother said: "When you make it right, I will settle." I said: "Well, the balance that you owe me will not pay me for taking up this case again, but I do not propose to have you in the position to say that I declined to finish this case, so I will give you another year." I did, and I obtained a result that was satisfactory to the parents and satisfactory to me. But I did four times as much work as should have been expended on the case, and in the end I had that child coming to the office every day.

Case IV.

The third girl was of still another type. She was the spoiled darling of a rich man and woman, but very intelligent, much more intelligent than her years would give you reason to believe; not only that, she had been allowed to believe herself the equal of any adult, if not superior of many of them. She said to me, "I want to tell you right now, at the outset, I am not the least desirous to have this work done, and it is being done against by will. If you go ahead and do it, you will not get any assistance from me." I placed bands on the cuspids, and at the next visit she handed me the bands with a smile of glee on her face, and said: "There are your bands, doctor, I hope you like them. Are you going to make new ones?" This is but a sample of her attitude. I did not get angry with her. We made slow progress. I have worked for the child for two years. Finally this spring I was not completely contented myself with the result, when she said to me: "You do not consider that finished, do you?" I replied, "Why?" She said, "You do not call that tooth straight?" I said, "No;" and she replied, "Neither do I." She then added, "Where would your reputation be if I went around showing my mouth to people?" I said, "My dear girl, I want to do the work for you; I do not care a snap of the finger for the rest of the money your people owe me. I have been more than anxious to make a success of your mouth, and I am delighted to have you talk that way." Then I put on retainers, and I said to her: "We will begin again in October." Pertly, she answered: "We will, if I feel like it."

If any of you should see a case with the original models, and then note a poor result, do not jump to the conclusion that the orthodontist was inefficient, incompetent or inattentive. There may have been mitigating circumstances.

I have simply related these cases to show you that the temperament of this patient has something to do with success, and to emphasize the point in the President's address that we should be charitable when we see bad results in the practice of other men.

Dr. J. Lowe Young, New York City. There is one part of the paper or address I would like to discuss briefly, and that is where the President refers to a change in our By-Laws in regard to membership. I can readily understand that there might be once in a great while a man who is not giving his entire time to orthodontia, nor teaching in some college, who would be a benefit to this society. On the other hand, I think it is very rare, and I believe our Constitution and By-Laws are so arranged that special men can be taken care of by being made honorary members. I believe there are a great many men throughout the country engaged in general practice who tell their clientèle that they are specialists in orthodontia, and who would come before this society, many of them, and say they were giving up a part of the time to orthodontia, when in reality they are perhaps only treating one case a year, and I am opposed to that part of the President's address in which he suggests that change. The rest of the address I think is splendid.

I am heartily in accord with the suggestion of creating a fund to pay for scientific research. I would be willing to give one hundred dollars toward that fund, or more if it is necessary, to get men who have a bent along these lines. Personally, I would not give up my time for such work, but for the man who does want to work along research lines, late at night and early in the morning, it is only fair we should have a fund to pay him something for his work.

Dr. C. A. Hawley, Washington, D. C. I wish I could express adequately my admiration of this address in almost every detail, but I cannot readily do so. There are some points that especially impressed me, and one that is particularly characteristic of the man who made the address, and that is calling our attention to the proper attitude towards the rest of the profession. I know I have been selfish in many ways in my consideration of my work and of other men's work, but it is well, as he says, to keep in mind the good we are doing to the profession, and the things I have heard said about general practitioners in connection with orthodontia to-day, and what they have learned since the American Society of Orthodontists has been organized, have impressed me deeply. We have done a tremendous work towards the education of the profession. It means more than the education of the profession. It means work for humanity and for the children of the age.

I want to emphasize what he says about the influence of the publication of our proceedings. I think that has been a large factor in the success of the society. I do not think too much can be said regarding the manner in which our proceedings have been published and their wide distribution.

In regard to the question of new members, I am rather in accord with the President. I know there are difficulties. I do not anticipate there will be any great influx of membership under that division, but I do know some men I would like to see take advantage of it. I would dislike to see any advantages taken of this society in the way of a boost of private practice. I know that can be done, and is done sometimes, but I think additions to the membership should always come from personal recommendation of members themselves, and if we can control that, we can get a number of men into the society to whom we can render a great deal of good, and they in return can do us a great deal of good. I do not think that the admission of such men to honorary membership would be a wise thing. Honorary membership means something far more than that. I think a man who is entitled to honorary membership should be one who has done something extraordinary and unusual for the society to confer that honor on him, and he should be a man of such standing that he can be properly received as an honorary member. It should not be by any means new members. Our laws will show that.

In regard to the suggestion that we report our failures, I wish to say, that I have had a good many cases I would dislike very much to show, but I would like to see the other fellow's cases. (Laughter.) Reports of our failures would do us all good. Sometimes it is a matter of management and sometimes a matter of knowledge. Many of my results are due to bad management, and many of them due to a lack of knowledge. This class of reports could come under "reports of cases." That order of business has been dropped, and I think it ought to be re-established.

Dr. Watson. There is one point only I would like to touch on for a moment, and that is with reference to associate membership. Please understand there is nothing personal in this matter. I had one object developed in my mind, and that is to benefit a certain class of men who, while limited in number, need help. I feel there could be greater usefulness rendered by the society. Whether others feel that way or not, I do not know. I wish to say, however, that my interest is first, last, and always, for the American Society of Orthodontists.

Regarding honorary membership for the men who are not specializing, it strikes me as not altogether fitting. I think honorary membership, as Dr. Hawley has pointed out, stands for something entirely different and I should feel badly indeed to see that rule changed. Therefore, if you do not want associate membership, let us not so far forget our dignity as to admit men to this class who are not qualified for the other class.

Dr. J. Lowe Young. I do not believe I made myself clear on the point referred to by our President. I did not suggest honorary membership to take care of this class, but of those exceptional men, who, while not eligible for membership, would really be a benefit to this society. These men can be taken care of by honorary membership.

Dr. Watson. It was not the exceptional man whom I was trying to provide a place for, but the man who is floundering in orthodontia, and who needs help. However, I have no feeling in the matter one way or the other, other than the thought I had expressed in the paper.

The Library of An Orthodontist.

By B. E. Lischer, St. Louis.

Though orthodontics is frequently referred to as the youngest member of the dental household, all indications point to such a voluminous literary output on the part of its devotees that it seems desirable to classify its rapidly increasing literature. Its international interests have likewise been so extended in recent years that one must keep in close touch with the work of colleagues in foreign lands if one wishes to be truly progressive.

The writer has frequently received letters from students and teachers of orthodontics regarding its history and literature, which indicate a growing interest in this phase of the subject. The following classification is offered merely as a beginning, and will, it is hoped, be of value to all who are trying to build up a library in this field.

I. General Works.

(a) *Dental books containing chapters on orthodontics:*

Angle, E. H.—American Text-Book of Operative Dentistry, Philadelphia, 6th Ed., 1911.

Berdmore, Th.—A Treatise on the Disorders and Deformities of the Teeth and Gums, London, 1768.

Bourdet.—Recherches et Observations de l'art du Dentiste, 2 vols., Paris, 1757.

Bunon.—Essai sur les maladies des dents, Paris, 1743.

Carabelli, G.—System. Handbuch d. Zahnheilk., 2 vols., Vienna, 1844.

Case, C.—American Text-Book of Operative Dentistry, Philadelphia, 5th Ed., 1911.

Catalan, L. J.—Memoire, Paris, 1826.

Colyer, J. F.—Diseases and Injuries of the Teeth, 3d Ed., London, 1912.

Delabarre, C. F.—Traite de la seconde dentition et methode naturelle de la diriger, Paris, 1819.

Desirabode.—Nouveaux elements, 2 vols., Paris, 1843.

Duval.—De la Arrangement des secondes dents, Paris, 1820.

Fauchard, P.—Le chirurgien dentiste ou traite des dents, 2 vols., Paris, 1728.

Fox, J.—Natural History of the Human Teeth, London, 1803.

Garretson, J. E.—A System of Oral Surgery, Philadelphia, 5th Ed., 1890.

Goddard, C. L.—American Text-Book of Prosthetic Dentistry, Philadelphia, 2d Ed., 1896.

Guilford, S. H.—American System of Dentistry, II, Philadelphia, 1887.

Harris, Ch. A.—Principles and Practice of Dental Surgery, Philadelphia, 11th Ed., 1875.

Hunter, J.—The Natural History of the Human Teeth, London, 1771.

Laforgue, L.—L'art du dentiste, Paris, 1802.

Lefoulon, J.—Nouveau traite de l'art du dentiste, Paris, 1841, American Ed., 1844.

Linderer, C. J. and *J.*—Handbuch der Zahnheilkunde, Berlin, 1834.

Linderer, J.—Die Zahnheilkunde, Erlangen, 1851.

Magitot, E.—Traite des anomalies du systeme dentaire, Paris, 1877.

Martinier, P.—Clinique de Prothese Dentaire, Paris, 1903.

Maury, F.—Traite complete de l'art du dentiste, Paris, 1828; American Ed., 1843.

Pullen, H. A.—Text-Book of Operative Dentistry, Philadelphia, 1908.

Schange, J. M. A.—Precis s. le redressement des dents, Paris, 1841.

Sewill, H.—Irregularities and Diseases of the Teeth, London, 1870.

Sigmond.—A Practical and Domestic Treatise on the Diseases and Irregularities of the Teeth and Gums, Bath, 1825.

Von Metnitz, J. R.—Lehrbuch d. Zahnheilk., Berlin, 1903.

Sternfeld, A.—Handbuch der Zahnheilkunde, 2d Ed., Wien, 1902.

Tomes, Ch. S.—A System of Dental Surgery, 5th Ed., Philadelphia, 1906.

(b) *Books on related subjects:*

Under this heading a long list of worthy texts could easily be presented, but the writer feels that each reader will prefer to include his favorite authors. Hence only a very few are enumerated.

Anatomy, Including Histology.

Tomes, C. S.—Dental Anatomy, Human and Comparative, Philadelphia, 5th Ed., 1898.

Anthropology.

Keane, A. H.—The World's Peoples, New York, 1908.

Biology.

Castle, W. E.—Heredity, New York, 1911.

Davenport, C. B.—Heredity in Relation to Eugenics, New York, 1911.

Herter, C.—Biological Aspects of Human Problems, New York, 1911.

Jordan and *Kellogg*—Evolution and Animal Life, New York, 1907.

Thomson, J. A.—The Science of Life, London.

Heredity, New York, 1908.

Embryology.

McMurrich, J. P.—The Development of the Human Body, Philadelphia, 1903.

Esthetics.

Santayana, G.—The Sense of Beauty, New York, 1905.

Metallurgy.

Essig and *Koenig*—Dental Metallurgy, 6th Ed., Philadelphia, 1909.

Orthopedics.

Taylor, H. L.—Orthopedic Surgery, New York and London, 1909.

Pathology.

Pickerill, H. B.—The Prevention of Dental Caries and Oral Sepsis, London, 1912.

Pediatrics.

Holt, L. E.—The Diseases of Infancy and Childhood, New York, 1897.

Rhinology.

Lack, H. Lambert—The Diseases of the Nose and Accessory Sinuses, London, 1906.

Sociology.

Ripley, W. Z.—The Races of Europe, New York, 1899.

Surgery.

Kolle, F. S.—Plastic and Cosmetic Surgery, New York and London, 1911.

Blair, V. P.—Oral Surgery (in press).

II. Special Works.

(a) *Books on orthodontics:*

Angle, E. H.—Malocclusion of the Teeth, Philadelphia, 1907.

Case, C. S.—Dental Orthopedia, Chicago, 1908.

Colyer, J. F.—Notes On the Treatment of Irregularities, London, 1900.

Dunogier, S.—Orthodontie, Paris, 1895.

Farrar, J. N.—Irregularities of the Teeth, 2 vols., New York, 1888.

Gaillard, G.—Des deviations des arcades dentaires, Paris, 1879.

Gaillard, G.—Orthodontie, Fasc. IX, Traite de Stomatologie (announced).

Gaine, Chas.—On Certain Irregularities of the Teeth, Bath, 1858.

Guilford, S. H.—Orthodontia, Philadelphia, 4th Ed., 1905.

Herbst, E.—Anleitung zur Gesichtsorthopädie, Bremen, 1906.
Atlas und Grundriss der Zahnärtzlichen Orthopädie, München, 1910.

Jackson, V. H.—Orthodontia and Orthopedia of the Face, Philadelphia, 1904.

Jung, Carl—Leitfaden der Zahn—und Kieferkorrektur, Leipzig und Wien, 1906.

Kingsley, N. W.—A Treatise on Oral Deformities, New York, 1880.

Knapp, M. A.—Orthodontia Practically Treated, Minneapolis, 1904.

Kneisel, F. Ch.—Der Schiefstand der Zähne, Berlin, 1836.

Körbitz, A.—Kursus der Orthodontie, 2d Ed., Berlin, 1911.

Langsdorff, G. V.—Prakt. Anweisung f. d. Regulirung d. Zähne, Würzburg, 1863.

Le Foulon, J.—Des deviations des dents et de l'orthopedie dentaire, Paris, 1859.

Lischer, B. E.—Principles and Methods of Orthodontics, Philadelphia, 1912.

Lomnitz, C. B. A.—Die Lehre vom Schiefstand d. Zähne, Berlin, 1840.

MacDowell, J. N.—Orthodontia, Chicago, 1901.

Pfaff, W.—Lehrbuch der Orthodontie, 2d Ed., Leipzig, 1908.

Subirana, L.—Anomalies de la Occlusion, Madrid, 1909.

Talbot, E. S.—Irregularities of the Teeth, 4th Ed., Philadelphia, 1901.

Walkhoff, O.—Die Unregelmaessigkeiten in den Zahnstellungen, Leipzig, 1891.

Wallace, J. Sim.—The Irregularities of the Teeth, London, 1904.

Werner, K.—Ueber Anomalien d. Zahnstellung, Giessen, 1868.

(b) *Monographs on orthodontics:*

It is gradually becoming apparent that as the scope and methods of orthodontics are extended, and its numerous problems worked out in greater detail, our texts and journals will be inadequate in comprehensive presentation of subject matter. For it must be admitted that text-books, aside from their inherent limitations, appear too infrequently to comply with all the demands of progress. Journals, on the other hand, rarely control, in advance, the scope of their contents. Hence the carefully edited monograph, with its detailed description of a single topic, will, in all probability, come into general favor.

In Germany, two series of monographs have already made their appearance, but they have been planned to embrace the entire field of dentistry. However, the following orthodontic numbers have thus far been published:

Herbst, E.—Die Regulierung der anomalen Zahn—und Kieferstellung mit Schrauben und Scharnieren; Heft 14, Deutsche Zahnheilkunde in Vortägen, Leipzig, 1910.

Pfaff, W.—Ueber die Entwicklung der Orthodontie, Heft 2, Sammlung von Vortägen aus dem Gebiete d. Zahnheilkunde, Leipzig, 1910.

Herber, Carl—Die Lehre von der Vererbung, etc., Heft 4, ibid., Leipzig, 1910.

III. Journals and Society Proceedings.

(a) *General journals and societies:*

From the earliest times, oral deformities have been observed and treated by physicians and dentists; hence medical and dental journals contain numerous articles which command our attention. To enumerate all is neither possible nor desirable, but the following stand out as landmarks in the evolution of the art.

Societies.

International Medical Congresses.
International Dental Congresses.
National Dental Association.
Illinois State Dental Society.
New York State Dental Society.

Journals.

ITEMS OF INTEREST, New York.
The Dental Cosmos, Philadelphia.
The Dental Review, Chicago.
The Journal of the British Dental Association.
The British Journal of Dental Science, London.
Deutsche Monatsschrift für Zahnheilkunde, Leipsic.
Oesterreichisch—ungarische Vierteljahrschrift für Zahnheilkunde, Wien.
Ergebnisse der gesamten Zahnheilkunde, Wiesbaden.

(b) *Special societies and journals:*

Recent advances have so extended the field of orthodontics that special societies and journals were deemed advisable. The excellent work thus far accomplished bears ample testimony to the wise judgment of the pioneers who inaugurated these undertakings. The following societies and journals are exclusively devoted to the advancement of the art:

Societies.

The American Society of Orthodontists.
Deutsche Gesellschaft für Orthodontie.
Alumni Society Angle School of Orthodontia.
Europäische Gesellschaft für Orthodontie.
The British Society for the Study of Orthodontics.
Orthodontische Gesellschaft in Wien.

Journals.

Zeitschrift für Zahnärtzliche Orthopädie, Berlin.
The American Orthodontist, New York.

IV. Portraits and Biographies.

Every student of the history of the art soon finds himself interested in the lives of the great leaders who were instrumental in promoting its progress. Hence a carefully edited *Portrait* and *Biographical Series* would, undoubtedly, be welcomed by many. But such a series presents two main difficulties: first, it compels us to distinguish between men of temporary popularity and those of enduring fame; and second, portraits of many of the founders need yet to be "discovered" in the libraries of America and Europe.

V. Bibliographies and Library Index.

Bibliographies of our literature may be divided into general and special, the earlier classifications being largely devoted to an enumeration of dental text-books. The following have thus far appeared:

Black, A. D.—Classified Subject Index to the Proc. 1st Dist. Dent. Society, N. Y., 1868-1909. Chicago, 1909.

Crowley, C. H.—Dental Bibliography, Philadelphia, 1885.

Linderer, J.—Die Zahnheilkunde, V, Erlangen, 1851.

Maury, F.—Treatise on the Dental Art, Appendix, American trans. by J. B. Savier, Philadelphia, 1843.

Port, Prof. Dr.—Index der deutschen zahnärtzlichen Literatur, Heidelberg, 1909.

Sternfeld, A.—Zahnärtzliche Bücherkunde, Kahrlsruhe, 1891.

Taft, J.—Index of the Periodical Literature of Dental Science and Art, Philadelphia, 1886.

Zahnartzlicher Weltindex—Ergebnisse der gesamten Zahnheilkunde, Zweiter Jahrgang, I. Heft. Wiesbaden, 1911 (and all subsequent numbers).

History of Dental and Oral Science in American, Philadelphia, 1876. Prepared under the direction of the American Academy of Dental Science.

If, to the above list, we add all the important essays which have appeared in the journals, it will be seen that the library of an orthodontist is one of considerable size, and the annual additions soon render it so unwieldy that a catalogue, or index, becomes indispensable. The following authors have suggested methods for this purpose:

Black, A. D.—The Dewey Decimal Classification and Index Applied to Dental Literature, Inst. Dent. Pedagogics, 16th Annual Report, 1909.

Weinberger, B. W.—Index of Orthodontic Literature, American Orthodontist, January, 1912.

Discussion on the Paper of Dr. Lischer.

Dr. Wm. E. Walker. I would like to take advantage of the opportunity to thank Dr. Hawley for asking me to open the discussion on this paper, for the reason that I was furnished a copy of the paper in advance, a copy which I have been very much interested in reading, although there is nothing in the paper to discuss. It is not discussable. I commend it heartily to all of you. It is a most excellent document to have in our libraries. It will tend to broaden us and make us get away from the tendency that some have tried to impress upon us of holding down certain narrow lines.

If it is not out of order, I wish to compliment the author on his new book which I had the pleasure of reading on the train while coming to this meeting, and those who have not a copy of it will find it worth while, because it is so different from the average book on orthodontia, in that the author gives credit to others and does not take it all to himself.

Dr. Frank M. Casto. Speaking along the line of literature, it occurs to me that it would be a very good idea for this society to have put into bound volumes the proceedings of the society since its organization, to be kept as the property of the American Society of Orthodontists.

The President. How would you keep them?

Dr. Casto. I think it would be a valuable thing to keep the proceedings of the Society in bound form as the property of the American Society of Orthodontists.

The President. If there were some place where these proceedings could be kept on file and referred to whenever necessary, it would be well. My experience in other societies is that when the proceedings have accumulated they have gradually been relegated to the archives, and somebody forgets whose archives they are relegated to. However, I have no desire to throw cold water on the scheme if it seems desirable to the Society.

Dr. Wm. J. Brady. Regarding Dr. Lischer's paper, he is eminently qualified to undertake the subject he has presented here in preparing a list of things that have been published on orthodontia. Judging from his new book, he must have read them all. He knows about them. I would offer this suggestion that this particular part of the proceedings of the American Society of Orthodontists be published in pamphlet form, so that we can have copies of this particular paper put in our individual archives, and not have to search the dental journals to find out many of the articles that it contains.

The President. Our proceedings are published, Dr. Brady. We can have reprints of the article. It is not exactly a discussable subject, but rather a matter of record.

Dr. Lischer. The only remark I want to make is that I have arranged for the reprints, so that I can sent a reprint to every member.

Suggestions Relative to Methods for Securing Co-operation of Child Patients in Orthodontia.

By Dr. D. P. MacMillan, Director of Department of Child Study and Educational Research, Chicago Public Schools.

In the nature of the case, it may seem superfluous or impossible to make pertinent suggestions regarding such a topic as this. On the one hand, to deal successfully with children in any capacity may be regarded as a personal gift, so that any prescriptive suggestions may be superfluous and unnecessary; and, on the other hand, for the very same reason that one person is naturally, or without formal instruction, successful in any capacity in the management of children, it is rendered impossible to teach or point out to others the methods that bring success to the successful.

While the extremes of this may be obvious to the point of platitude, nevertheless it still remains true that our topic is deserving of attention and of careful consideration.

Naturally I am speaking from the point of view of my own personal experiences as examiner of children, for during my ten years' span of time as director of the Department of Child Study and Educational Research of the Chicago Public Schools, I have had more intimate acquaintance, perhaps, than any other person in dealing with all types and characters. Our daily experiences may bring us into contact with the deaf child normal and sub-normal, the blind child, the out-and-out truant and incorrigible, the crippled child, the child of sub-normal mentality—that borderline group which lies between the highest order of the feebly-gifted and the child who is simply backward in school studies; the unmanageable child in home and school; the nervous and excitable, as well as the phlegmatic and stubborn child; the precocious and suggestible child, and so on throughout the list of variables in human nature; and, furthermore, it must be borne in mind that all these types and traits in children come from home, environment and training that present all grades and degrees of eccentricities and inefficiencies.

There is one great difference, however, between my dealings with children and your professional work, of which I must not be unmindful; and that is, that neither from parents, teachers, officers, nurses in attendance, or examiners, is there a history of any child having suffered any pain. Nevertheless I believe that the resmblances between our lines of work are greater than the suggested differences, and on this basis alone I am emboldened to believe that common principles can be found of sufficiently common applicability to make it worth while to recount some of them.

Importance of First Meeting.

As already indicated, I am speaking only of the common requisites for securing the co-operation of the child patient. First and foremost, because your work involves a personal relationship; the initial meeting demands that the attracting elements or captivating features of personality must be in evidence. This means the optimistic temperament; the sunshiny buoyant mood; the happy, hopeful good will and kindly attitude; and withal, the calmness and self-possession that engenders confidence and yielding. No brooding nor sour disposition; no fault-finding and fidgeting; no reserved, retreating, nor indifferent attitude, will ever tend to set up the first elements of right relations between operator and patient. And this is never so true as in the case of a child, and never so imperative are the demands upon positive attractive qualities, as in dealing with the difficult child.

Like all service, the alphabet of success lies in the direction of taking the point of view of the served. This is tact, and in your personal intercourse with the child, it is not only the beginning of wisdom, but the end as well. For this reason I believe there should be an introductory visit of the child to your office. at which time the lines of conversation must be set with a point to them well defined in your mind, and at first equally well concealed from the child. At this point pictures of children's mouths may be introduced, emphasizing pretty, well-formed and regular teeth; happy children exhibiting well-formed mouths; and perhaps this first visit may end with the child consenting to show his own mouth, and in your getting him to ask to have his teeth felt for unevennesses, etc. On a note, without the child's knowledge. make an appointment with the mother, guardian, nurse or other attendance, and clinch your first good impression in the farewell.

On the return of the child for the first appointment for work, simply taking impressions or what not, I believe that altogether the best results are secured by having the child alone with you, excluding mother or father, nurse, governess, or older sister, or whoever it may be. In this way your chances are enhanced of working on the basis of the friendship already established.

Gaining the Child's Interest.

However, the crucial point begins to loom up large, for it is time to consider how you can proceed to procure the co-operation of the child in the projects *you* have planned. Apart from the child's pleasant reaction to you as a person, you must go farther and sustain this favorable impression in you as a professional worker, and this means catching the child's interest in your plans. Do not speak of a possible or probable benefit to him, but rather of a certain good. Be as childish and voluble as you please, but bring out that as "others have done it, you can do it easier"; "this child (give name) thought it was hard to do and he found it so easy"; again, "so-and-so said there was tightness and strains and queer feelings at first, but he said that he just kept thinking how good it would feel to have it done good, and he just stuck to it"; and so on with the added and necessary variations. Keep the positive side foremost, and do not even allude to those who failed or were frightened.

Keeping the Child's Interest.

Further, it must be remembered that holding the interest is quite a different matter from merely catching it. Remember, however, that the basic elements are the same. The child's personal co-operation in the work must be emphasized. Keep talking of what this or that child wanted done *for* him, not done *to* him; and how you heard so-and-so (a child) say that he or she heard other children say how much better so-and-so looked with teeth adjusted properly—how lots of children said that their little friends admired and envied them. Give names and be otherwise concrete. Moreover, emphasize and repeat numbers of times to your little patient the prominent part he or she must play after leaving you. Employ partnership terms and keep prominent by suggestion the success-feelings.

This matter of suggestion, by the way, is of vital importance, and withal a very simple thing, for upon analysis you will find that to lodge a suggestion successfully, only three things are essential: (1) a clear, simple, well-defined thought by the suggester; (2) a passive recipient mood on the part of the receiver; and (3) a perfect understanding and mutual sympathy between suggester and recipient. For your purposes you can have your thought clear, not relative to what you want done (that feature of the whole your professional skill will forecast), but rather as to how you are going to proceed to secure co-operation in getting it done. Do not leave it to chance and happy-go-lucky incidents and accidents, but make chance your ally in your well-laid-out plans. The receptive mood you can induce, because, first, your child is in the expectant attitude when he visits you, and your persistence in repetitions will sustain you. Again, if the situation is worked up carefully, and you talk enough along positive lines, you can sustain the mood; and finally, when you secure that perfect understanding between you which is backed up by mutual sympathy, your idea takes hold and persists.

But your query comes naturally at this point, "If active co-operation must be secured, how can one advance in the face of the fact that not enough intelligence or mental stability is present in the child for you to gain a firm foothold to make any progress after work is begun; or, perchance there is pleasantness enough in your relation to the child, but not enough courage or tenacity of purpose on the part of the child-patient to enable you to build up any measure of success; or, further, the child may be of the type that is simply stubborn and resisting, either of the open-faced bravado, non-serious kind, or of the exact opposite, the timid, fearful, passive species, although no less mulish than his laughing, defiant companion.

Obtaining Obedience.

In all such cases you must be a ready classifier of persons, as, in fact, the great majority of dentists prove to be, and the aspect of co-operation that will now engage your attention is obediance. Recall to mind that in general there are four different kinds of obedience which a child, or for that matter an adult, renders. First, there is passive obedience arising from mere lack of will, or supineness. In such cases at your hand, the best recourse is in a gentle and wise coercion, the imposing of your ends and aims along the lines already induced in general terms of suggestion. Secondly, there is that type of obedience which comes from liking or affection for the person issuing the commands. The kind of resistance which you encounter from children of this sort may be considered as negligible in your work. Thirdly, you will be sure to meet that type of compliance termed prudential obedience which calculates the advantages of conforming or not conforming. Here again, you will find it relative easy to weigh down the balance in your favor, provided only you sustain the attitudes and methods of procedure suggested. Fourthly, there remains that highest type of obedience which yields to submission of authority of one who knows, and which involves free, intelligent compliance and co-operation. This is the form of obedience which we have been discussing under the term "co-operation."

The Sub-Normal Child.

Taking these specials in the order previously named, it is probable that more difficulty is encountered with the first of these, the very immature, backward child, with his variety of temperamental grades, than with any other type of special child. The case of this grade of child is all the more important because defective teeth-formation plays such an important rôle, if not understood in the sense of being a primal cause of backwardness—a point which I am not now to discuss, but it is a matter which requires consideration in such a body of workers as this—it must at least be stated conservatively that imperfect dental formation and function in some form is an almost invariable accompaniment of sub-normality. As a general statement, it may be said that in dealing with a subnormal child it is always necessary to appeal to the simplest, common, or basic motives, or select one to fit the case, and repeat it over and over again with patience and persistence; and, be it added, if possible get a motive new to the child. With regard to the abnormally timid, one can speak less of methods than in the case of any other type. Here, successful management is a matter so largely of personality, of placating and pleading in the most eloquent sense, that all I aim to do is to suggest the necessity of mild, yet persuasive treatment of immature personalities.

The Stubborn Child.

When we come to consider the next type, I am sure you will all recognize your familiar "friend, the enemy," the stubborn, bold child, who confronts you with open defiance, is best met by an open wager, appealing to his best asset, his effrontery. If you cannot make the bet yourself get action on it by a third party, and the mulish timid child must be approached by some bribe that you determine, indirectly or from others, lies in his circle of ideas and is close to his chief desires.

.Moreover, in the treatment of the stubborn child of all types, strange as it may seem, it is better to make commands and requests, or appeal in some form, impersonal or even co-operative. For instance, do not address the child as "you," with the emphasis on the particular, or the one at the end of the index finger, but rather in statement as "we" must do so and so, or "every one does thus and so," "it is the best thing to do," etc.

It is said that every person suits his philosophy of life to his temperament; it is no less true that one's personal address, manners, habits and tricks are his own and in a measure unchangeable, but nevertheless I am sure it is not necessary for young men to wait until life's experience and age teach their lessons in your total span of working-days, but the art of managing children can be acquired by giving attention to the persuasive arts that bring success to a few. Apart from your professional zeal in technique and skill, I am making an appeal for a greater number of orthodontists desiring to work with children, when indeed such work is the most significant, and if my present remarks shall assist in any degree in increasing the efficiency of those who are undertaking such an immeasurably valuable service with difficult children and youth, I will account my compensation complete.

Discussion on the Paper of Dr. MacMillan.

Dr. Lloyd S. Lourie. I consider this paper of unusual benefit to us. We go to considerable pains to get accurate impressions, models, photographs, etc., in order to consider the physical and mechanical problems to be encountered in our treatment. How many of us have made any preparation for dealing with the temperaments of our patients along the lines indicated and suggested in the paper of Dr. MacMillan? We have left that matter entirely too much to chance. I know I have, and I believe that where we have been successful it has simply been due to the fact that we have been fortunate in hitting upon the proper means of handling these patients. Some of us have natural aptitude for dealing with these cases of children generally. Many general practitioners of dentistry cannot get along with children and even that type of man would be able to add to his success if he would, at the start, adopt the plan outlined in this paper, of having an introductory visit for the purpose of dealing with the child's mentality and securing its co-operation.

Of course, there are many valuable suggestions in the paper that we will be interested in examining and analyzing and adopting, but to me the important thing is the idea of the preliminary plan of dealing with the child. When it comes to some of the minor details of dealing with children, I believe one of the most important is to relieve their minds of fear. I do not detract from the value of the general practitioners' service in the least, but many children come to the orthodontist in fear, the result of dental operations in which the dentist was obliged, from the nature of his work, to hurt them, whereas it is unnecessary in orthodontia. If I hurt a child it is because of some accident on my part, or a lack of co-operation on the part of the child. I arrange my appliances so that my promises can be fulfilled, so that if I get too much pressure on a tooth the patient is at perfect liberty to relieve it. Of course, some parents will say that you cannot give the child that privilege, and if you do, that it will take advantage of it, but I have not found it so. I secure the confidence of the child first. I would not make a promise unless I could carry it out. If I should tell a child that I am not going to hurt him, and then hurt him, that child would not have confidence in me. A great many men assume that children are not capable of reasoning or appreciating explanation. They can and will, and time spent in explaining to them is well spent. Not only must the explanation that pain is not a necessary part of the treatment be made clear, but we should impress this upon the parents as well as the child. Many times I have secured the consent of children to do certain work for them, yet the parents have been so thoroughly convinced that pain and severe physical and nervous strain were a necessary part of the orthodontic treatment, that it was difficult to get that idea out of their heads.

Another thing in which I differ from some is this: I would not force a child to have anything done. I believe that is a mistake. I have turned several children away from my office simply because I could not change their point of view. One young lady in particular was just as emphatic in her assertions that she would not be treated as was the girl mentioned by Dr. Ottolengui yesterday. I told that patient I would refuse to do anything unless she changed her attitude. The case went along for six months; in the meantime the young lady found I was not going to antagonize her, and it was not long before she was actively co-operating with me in the treatment, though the parents had lost interest.

I am sorry I did not have a copy of Dr. MacMillan's paper to make more notes for discussion along the line of the valuable suggestions he has made. He has not only had a wide experience with all kinds of children, and especially defective children, but he has along with that experience classified his observations and his plans for handling them. There is where he has the advantage over any of our haphazard methods or experiences. Possibly we can get Dr. MacMillan to enlarge on some points in his closing discussion. I think most of us are able to deal with the normal child better than with the sub-normal. For instance, take a child that is backward mentally, or who cannot concentrate its attention upon your suggestions or instructions; such a child may be willing enough to do so. These cases have been hard to treat. In the ordinary cases, one can study temperaments and try to devise means of overcoming their peculiar whims, but these patients, it seems to me, require special study.

Dr. J. Lowe Young. I have been very much interested in this paper I think it is one of the best we have ever had before this society. I think it will do the members of the society more real good, probably, than almost any paper we have ever had, and I think we are very fortunate to-day that we have had Dr. MacMillan give us this paper.

I really cannot take any objection to the paper. There is one point

Dr. Lourie brought up that I wish to enlarge on somewhat, and that is the foolish attitude of the parents in many of these cases. I have had one of the sweetest and most delightful of children to work for. She would absolutely let me do anything, and yet the mother, after I had been treating the child a little while, would come to me and say, although I did not know there was any friction going on, "Doctor, I don't understand how you have been able to do this for my child without hurting her." She says every time the child comes home from my office she asked her, "Did he hurt?" The child would reply, "No, mother." I told the mother that she was not acting fairly with me; that she ought to know perfectly well that if her child was having any pain she would say something about it. "Yes," the mother would say, "I did not realize this could be done without pain," and that started me on different tactics. I insist always on having an audience with the parents. I prefer, if possible, to get both of them present, but always one, before I begin the treatment of a case. I make it a point to bring it clearly to their attention that the operation will not be a painful one and that I do not want the parents to mention even the word hurt or pain to the child; that if the child is having any trouble and complains, then the parents are to let me know. I do not intend that the child should suffer. I make that point clearly, and I find it has a beneficial effect on the parents.

Dr. Lourie spoke of never forcing a child. I believe there are certain cases of young children where it becomes necessary—at least I have found it so in my practice, and I won out. I had one little fellow, eight or nine years of age, who never was controlled before he came into my office. But I had no trouble in taking impressions, and I bribed him to let me put on an upper appliance. I did not have much trouble—in fact, I did not have any trouble. He came back for the lower appliance and said to me, "You are not going to put it on." "Oh, yes I am," said I. He said, "You are not"; but I said, "I am." The boy put up a fight and I "threw my hat in the ring" and got busy. He said, "I won't open my mouth.' I replied, "I don't care." I got two fingers in the corner of his mouth and he opened it. He tried to get my hand away with his. I had my assistant hold one of his hands and I held the other. Then he started to cuss me. I put my hand over his mouth to prevent this and he cussed me through his nose. I closed that and held him until he began to get dark from lack of air. I let go and said, "John, have you had enough?" He replied, "Yes," and was crying. I said, "Are you going to be good?" He replied, "Yes." I said, "That is right, my boy." I went to work and put the appliance on, and after I got through we had a hugging match. We were very good friends. His mother was in the room all the time. But he has a deficiency, without doubt. I have never been able to keep a ligature on that boy's teeth. I do not know how I would do with wire ligatures, but he cuts off the silk ligature before he leaves the office. I have treated him with other methods, and I am getting him very near to the final treatment. There was a child who could have been appealed to by waiting for at least several years, but as I believe in the early treatment of such cases, I decided to have a fight and have it over.

Dr. R. Ottolengui. I have been delighted with the paper that has been presented to us by Dr. MacMillan, and I am going to make a rather peculiar comment on it, somewhat different from the one Dr. Young made. This is a test of telepathic psychology, and the essayist can answer it in his closing remarks. I have an idea that the essayist, when he was writing that paper, had an attack of timidity; he was going before a new kind of audience, and he was just a little afraid he might be riding a hobby to such an extent that we would not appreciate it. In other words, I think he knows a great deal he has not told us, and I could almost wish that before the paper is published he would elaborate it. A great many years ago I was fortunate enough to get hold of a valuable work which dealt with the subject of suggestion, and I know the importance and value to the practitioner of having a real appreciation of what can be accomplished by suggestion. Yet the mere statement that one can do things by suggestion is not an adequate expression of what can be done. I am impressed with the idea that this gentleman understands this subject and that he has only scratched the surface, and I repeat my wish that he give us a little more. I have felt for a long time that there was room—yes, a need for this kind of paper. I am very much in accord with everything he has said, but I was particularly pleased to see that some of the crude ideas I have had could be classified and made to become useful rules. I have sometimes thought that the successful management of children is largely a matter of experience. That would be unfortunate because the younger man who is taking up the work would be obliged to wait a long time to get the experience which will make it possible for him to take care of children, study their characteristics and determine the line of conduct that will best serve his purpose. I wish Dr. MacMillan would tell us more and go into further detail with reference to the classification of temperaments and peculiarities of children and the means by which suggestion can be made useful. Sometimes we are very sensitive to the character of the individual with whom we deal. We jump immediately to the conclusion as to what is the best line of treatment. The very last boy that I saw before I left New York came in incidentally with his mother, and there is no work to be done for the boy until next year. I knew nothing of his character or temperament. I cannot tell you what led me to make the remark I did. But I took him by the shoulders and said, "Goodness gracious, are you only twelve?" He said, "No, I am only nine." He was delighted because I took him for a boy twelve years of age. That will be a valuable asset to me because I have since been told that he is a bad boy. I had flattered his vanity when I took him to be twelve. That is only an incident, but I have made a good impression by suggestion. The suggestion in his mind may lead him to think, "Well, here is a man I am going to get along with, he appreciates me." As I have had a hint from his relatives that he is difficult to deal with—he is the only child and a spoiled child at that—it will become necessary during the first few visits of that boy to the office to treat him absolutely without discomfort. He must have his good opinion of me accentuated and deepened until it will be a great surprise to him if I do anything to him that hurts him. If I should hurt him the first day he comes to the office he would think it was intentional and he would not want to have anything to do with me.

I have another boy in mind, more or less a weakling. His people adopt a good means of helping him. If he shows timidity his mother says to him, "Jack, are you a man or a mouse?" "I am a man," asserts the boy, and the assertion stiffens his backbone. The first time he came to me and I wanted to take an impression of his mouth he was timid. He looked up and said, "Doctor, can I ask you something?" I said, "Yes." "Did you ever do that to a boy my size before?" "Certainly, and to much smaller ones." He said, "All right, you can do it to me."

But there is a great deal we have to learn. We cannot treat all children alike. Some we can treat through experience and some by intuition. A good deal perhaps we can do by rules. But the fundamental principle of success with children is that you must be fond of children; not pretend to be fond of them, but actually be fond of them. Believe me, if you hate a child he will find it out without any letter being written to him on the subject; and in the same way, if you love a child, he will do a lot more for you than if you are just thinking of dollars and cents.

Dr. B. E. Lischer. I would like to ask Dr. MacMillan a question regarding untruthful children. I take it for granted he is aware of the fact that the number of apparatus for treatment requires co-operation of the patient to the extent that certain parts of it must be renewed by the patient. Let us take, for instance, the application of the elastic rubber band. The child is asked to renew it in order to avoid frequent visits to the office. I have come to the conclusion in several of my cases that the child replaces them on the way down to the office. Of course, we all have these experiences, and we have several ways of dealing with children, but I would like to have Dr. MacMillan state what he considers the best way of treating that kind of child.

Dr. Varney E. Barnes. I am much interested in that part of the paper of Dr. MacMillan which deals with the sub-normal child. I am glad he touched on that phrase of the subject. I have been experimenting now for two years with the children under the care and watch of the teachers of the special schools in Cleveland who have taken orthodontic treatment, and there has been a remarkable improvement in the children, but I do not think such treatment will bring the abnormal child up to normal. It may aid them.

Again, in controlling these children, we must remember we are dealing with sub-normals of different grades, and the one that is markedly subnormal may require some test to determine the relation between the physical and mental condition of the child. That test will give suggestions how to manage a child along the lines Dr. MacMillan has suggested. You cannot expect to do with them as with others. You must not only appeal to the child, but you must know that you have the co-operation of both parents. I have absolutely refused to undertake the treatment of a case unless I have the co-operation of and a statement from the parents that they will help me when I have not the child under control.

Dr. D. P. MacMillan. I have been much interested in the discussion. I have, of course, limited my remarks only to the attitude of the child. To be sure, you must have the addition of co-operation of the persons nearer to him or in the immediate environment in which he lives. This means sometimes that you will have to call in the parents, or, in addition, you may have to call in the chum of that child, because after all the aptest or best suggestors for children are children. I agree most heartily with what has been said in regard to securing co-operation of the parents, because in many cases you will have to secure the active co-operation of the child indirectly as well as directly, but I believe in making the child teach the parents, because the child is a person you can teach and you can get down to his level if you have the tact and ability, and if you have that native fondness for children. Unless you get the point of view of the child, which means sympathy, fondness and affection for the child, it is very difficult for you to secure his co-operation.

The temperaments of children are so variable that is almost hopeless to try to classify them. There is only one method that will assist you in making rough classifications of them, namely, the difference between the four types of classic temperaments. For instance, the child who is quick in perceiving and who reacts (pardon that expression) slowly. If we try to operate upon him he acquires resentments, and they increase in magnitude. There is the other, the quick child, who receives impressions quickly, but they fade away just as quickly, and the next moment the mind of the child is on a different kind of event, which comes quickly, and fades quickly. The other type of temperament is the slow phlegmatic, slow in getting reactions; slow in working off; and another type would be the child who receives impressions slowly, but their effect is quick, but they pass off.

You can suggest to a child success. It is simply wonderful how a person can take the measure of adults if he takes the measure of children; how a person can get his point of view if he can get it befor the adults, provided you attempt to get yourselves in the mental status of the recipient. Suggestion is exceedingly important. The whole matter of personal relationship is suggestion. I ask a question and by attitude suggest your answer. I approach you with a remark and my attitude draws it out of you. I mean that my whole personality appeals to you in a way. There is nothing in the world that brings success like a strong personality. You see sincerity, clearness of idea, strong emotion, and a quick courageous will—all these appeal to you strongly. Those are the characteristics of the strong person. Sometimes it requires the predominance of the effective element to make a person attractive. You can make yourself appealing to a child. In other words, you can make the child want you. That creating of the desire to win your service, to win your co-operation, is the important thing.

As to the imaginative part, the child has a part, to be sure, but again, I believe you can get at the motives that actuate the child in action. If it is pride, or a desire to show off before other children, a desire to appear better than others, it may overshadow anything else. But if you shoot enough ideas around him you will catch him. If you suspect that a child tells lies, the primal thing is, first, to find out why he lies. If it is boldness, resistance, retreating to be afraid of the result, it is easy for you to get that. If it is a plain desire on the part of the child to deceive you, you can get that. If it is the unstable surplus or superficial thinking, you can get that, because if you stay with the child long enough you can determine the elements of personality that he lays emphasis on. He has some idea of what constitutes a desirable person. You may be as sure of that as you are of any plan of action, and the thing that is necessary is to find him on the lines of his strength by beginning with the lines of his weakness. Regarding the point of view, finishing that thought, I should remark that if a child lies to you, resists you, you can check him before you begin to work and lie to him and see how he reacts. You can get his reaction on that. Then you can begin on the positive side and tell him the situation that he was in is plain, and in nine cases out of ten you can circumvent him.

Regarding sub-normals, there are one hundred different types. It is unnecessary to use tests or the many scales of gradations to tell how old a child is. All you want to do is to carry your experience to the family or to the neighbors and ask a group of questions about the method of the child in getting to your office. It is simply reasoning about directions, whether counting money, asking the time of day, or the time of the week, etc., and engage the child on the lines of his conversation to get his topic.

I could put this subject before you in greater detail if time permitted. but would like to make a personal appeal to you so that you can see the desirability and necessity of dealing with children through and by suggestion. I believe if you can suggest success, in ninety-nine cases out of one hundred you can study and treat your cases to great advantage. (Applause.)

The Province of Orthodontia.

By E. A. Bogue, M.D., D.D.S., New York.

Orthodontia is naturally divided into three headings. First, the ordinary, slow orthodontia, which is the kind generally practised by those whose main thought is to readjust malposed teeth into proper alignment. It was the malposition of permanent teeth that first brought into prominence efforts for their correction. The prevalence of pernicious influences and conditions has been, and remains, so constant that a specialty has grown up whose object is the correction of those abnormal conditions. This work has called into play the best qualities of mind and heart of those who have taken up its practice. That this is true is recognized when the names of orthodontic practitioners throughout the country are mentioned. The anatomy, physiology and hygiene of the parts involved have been more closely studied and much valuable knowledge has been obtained through that study. A great many men have been at work in Germany, France, England and America, and a great many facts have been disclosed that were in themselves well known but whose relation to this subject had not been fully realized; for instance, stooping shoulders, deficient lungs and weak heart, all growing out of an inability to take in enough air in babyhood through the natural channel of the nose. Another example, the greater liability of mouth breathers to contract contagious diseases. Another instance is the almost invariable connection between a high vault of the palate, known as a saddle-shaped arch, and the two conditions just named. These premises being granted, we see at once the immense range over which the subject of orthodontia must reach. In ordinary, slow orthodontia, the time employed is so great that cases have arisen among rhinologists in which speedy relief was required and the rhinologist has turned in vain to the orthodontist for that relief.

Rapid Spreading of Maxillary Bones.

The second heading would embrace *rapid* spreading of the upper maxillary and is, of course, applicable only to what are known as *contracted* arches—strictly arches that have not expanded normally, and consists in a rapid movement of the two halves of the upper maxillary bones, operating through the instrumentality of the teeth, and opening slightly or considerably the suture between the two halves of the intermaxillary bone and probably of the maxillary.

This almost always and very promptly relieves nasal stenosis, and straightens out nasal septa if the case is not too far advanced. This spreading can be very promptly supplemented by orthodontia of the lower teeth as well as of irregular front upper teeth, bringing them into proper occlusion with the new positions of the upper row, which also can subsequently have the little niceties of adjustment attended to after the apparatus used for rapid spreading shall have been removed or shall have done its work and become stationary.

Drs. E. J. Talbot and G. V. I. Brown have long advocated rapid spreading of the upper maxillaries in such cases. Dr. Varney Barnes is now taking the same ground, as is also Dr. Haskin, a rhinologist in New York.

I have been doing this same thing, more or less modified, according to circumstances, for children between six and nine years of age; in two instances when they were nearly ten, which is quite the limit for operations of this kind to be performed by means of the temporary teeth.

Preventive Orthodontia.

This brings me to the third heading which comprises what we may call preventive orthodontia. This preventive orthodontia is practised exclusively upon the temporary teeth of very young children, which by being early drawn into the positions that they ought to occupy, carry with them the crowns of the permanent teeth lying immediately beneath them, so that when the temporary teeth lose their roots and in the process of development fall out, the permanent teeth are already in the positions they should occupy, the antra are of approximately normal size, the septa reasonably straight, the nasal passages ample.

Orthodontia of the permanent teeth in these cases will not often be needed.

The results in all my cases have been so gratifying that I take the liberty of presenting herewith a summary of the principles underlying what I have done.

If this compilation, now rewritten, can serve my brethren of the Society of Orthodontists, I shall be very glad, for I have an idea that many among them will be glad to prevent, as much as in them lies, the evils that often come to a child born in a civilized community, which evils, if not corrected before six years of age, will exert a malign influence through life and, not infrequently, shorten life itself.

Summary.

First—The regulation of the temporary teeth is the most important feature in modern orthodontia.

Second—The prevention of dental deformities requires the retention of the deciduous teeth in their proper positions, and proper relations to each other until the permanent teeth are ready to erupt.

Third—Adenoids are a cause of dental, nasal, facial and thoracic deformities.

Fourth—Hypertrophied adenoids may be discovered at a very early age through the presence of snuffles, ear trouble, paroxysmal cough or mouth breathing. The adenoid may generally be easily removed during the first year of life without an anæsthetic, and almost without hemorrhage or pain.

Fifth—The early discovery and removal of adenoids and thorough performances of the functions of mastication and breathing are the surest preventives of irregularity among the temporary teeth. We find an intimate relation between irregular teeth and the whole category of children's diseases.

Sixth—Irregularities among temporary teeth are about as frequent as among permanent teeth.

Seventh—The surest preventive of dental deformities, as well as of contagious diseases, which are acquired through mouth breathing, is to spread the arches of temporary teeth, when too narrow, and to correct malpositions that prevent proper articulation.

Eighth—Under-developed dental arches are evidences of lack of vigor. Nature, unaided, cannot spread them. Almost all irregularities mean an arrest in development. Protrusion of the front teeth indicates a narrowed arch which is another symptom of arrest in development.

Ninth—Spreading the arches of temporary teeth enlarges the nasal passages and allows the mouth to close, thus preventing the entrance directly into the lung of the air-borne microbes of contagious diseases, and forcing them to pass through the filter of the nose.

Tenth—The relation existing between the temporary incisors and the permanent ones can, by measuring the width of the upper temporary incisors, be ascertained with sufficient accuracy to furnish a working basis for the calculation of the size of the permanent arches.

Eleventh—A standard relation between the width of the upper central incisors and the proper width of the dental arches has been demonstrated, so that one may be calculated from the other.

Twelfth—Correcting dental deformities before the sixth year, not only assures fairly correct arches of permanent teeth, but aids in the correction of nasal stenosis, due to deflections of the septum, and aids in the correction of curvature of the spine, which carries with it the ribs, an irregular breastbone, and stooping shoulders.

Thirteenth—The child's brain at six years of age is within 40 grammes of its weight at nineteen years of age; hence it is most important that all irregularities of nose, face or teeth should be corrected before the sixth year while growth is at its maximum.

Fourteenth—Perfectly close and regular teeth at five years of age indicate a marked deformity, and are an absolutely sure indication of a crowded condition in the permanent teeth beneath.

Fifteenth—The normal arch of temporary teeth at five and a half years of age, its front teeth being spread apart normally, should correspond in size to the arch of the ten front teeth of the permanent set at the date of their eruption.

Sixteenth—The conditions which most call forth attention of the orthodontists at this early age (four to six years) are two, prognathism of the lower arch and the continuance too close together of the temporary teeth, especially the six front ones up to this age. At four years of age these arches can generally be spread in from fifteen to ninety days, at small expenditure of time or money, and without pain if the child has been well brought up and has not been frightened. At five years of age it may take months to accomplish the same result, and at six years of age one can never be sure of results under two years, although the actual movement may have been made in two months or even less.

The Influence Exerted by the Dental Arches in Regard to Respiration and General Health.

By Mathew H. Cryer, M.D., D.D.S., Philadelphia, Pa.
Professor of Oral Surgery, University of Pennsylvania.

The principal object of this paper is to show that great improvement can be brought about in respiration, both nasal and oral, by widening the dental arches. This will also produce a change for the better in the nasal cavity and its accessory sinuses with the drainage and ventilation of these spaces, all of which will tend to improve the health of the patient. This improvement can take place regardless of opening the suture in the region of the maxillæ.

In order to speak intelligently on this important matter, one should know the difference between normal and abnormal respiration. One must also know the anatomy of the respiratory tract, especially of that portion which gives passage to the air from the nostrils through the nasal chamber to the glottis, and from the lips through the mouth to the glottis.

Influence of Tongue on Normal Respiration.

In the first place, normal respiration is not carried on alone through the nasal chamber. When one is at rest, the breathing is carried on through this channel if the respiratory tract be normal anatomically and physiologically; but when the normal person becomes active, he breathes through the mouth as well as through the nose, in proportion to the amount of exertion used. In talking and singing, it is absolutely necessary to breathe through the mouth. In fast running, in jumping, or in swimming, the mouth is again a very important respiratory passage. If the dental arches be narrow, the tongue will be forced backward into the pharynx and obstruct breathing, especially through the nose, and a person with such dental arches could never become a champion in athletics, no matter how great might be the width of the floor of the nasal chamber.

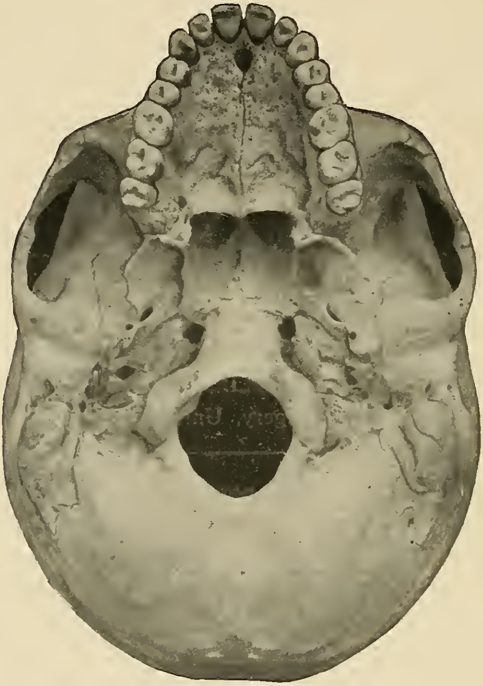


Fig. 1.

Development of the Jaws.

It may be advisable here to give a brief review of the development of the upper and lower jaws. We find that the bones of the brain case are in an advanced stage of development before the facial bones commence to build. To such an extent is this the case that the dermoid structures are nearly in contact with all of that portion of the head below and anterior to the notochord. At this time there is no opening into the alimentary canal.

The facial bones arise from the under surface of the brain case, from certain processes that push outward and downward, leaving a layer of dermoid tissue on their inner as well as their outward surfaces. This dermoid tissue becomes the mucous or epidermal lining of the mouth, the nasal cavities, and all internal surfaces of the face.

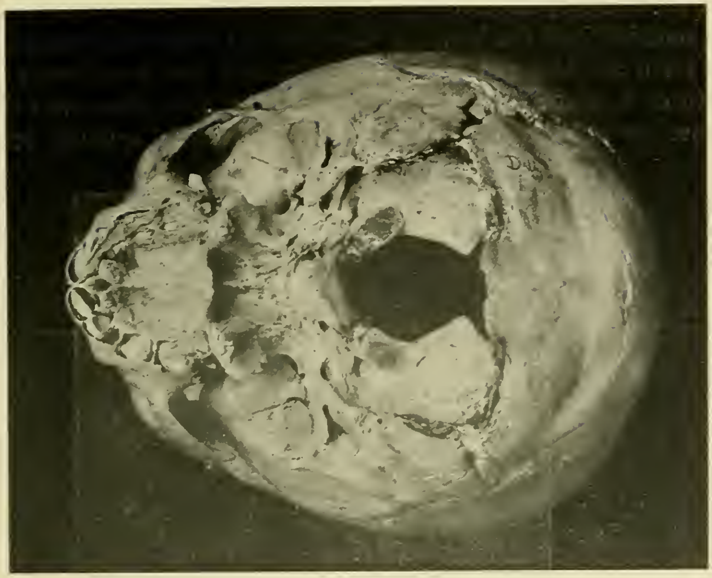


Fig. 8.

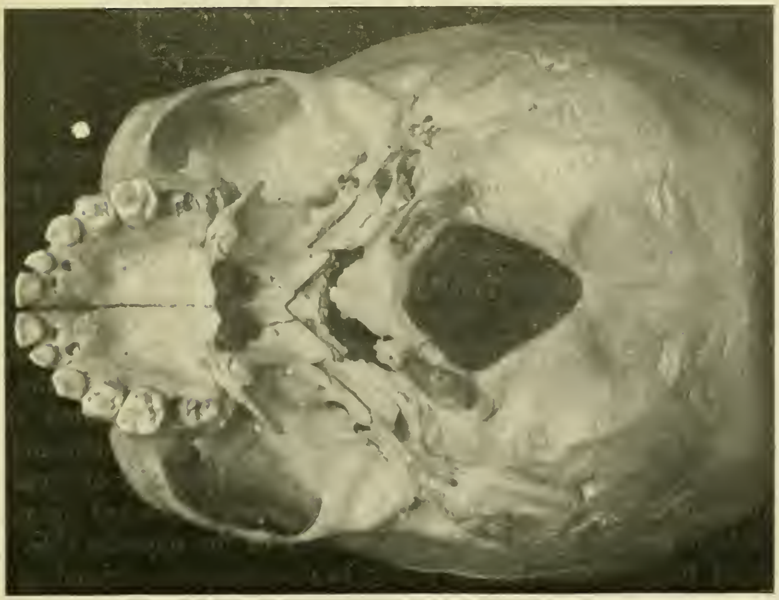


Fig. 2.

It is from this dermoid tissue that the teeth and alveolar processes take their origin, and not from the developing buds or processes that form the remainder of the bones of the face. It is for this reason that when the teeth are lost and there is no function for the alveolar process to perform, it is also lost. It is for this reason, also, that when the dermoid tissues are attacked by systemic diseases, such as syphilis, scarlet fever. etc., the teeth and alveolar processes are involved simultaneously with the skin, as are also the bones of the face, which were covered originally with this dermoid tissue. It is quite possible that pyorrhea alveolaris may also be a manifestation of a dermoid disease.

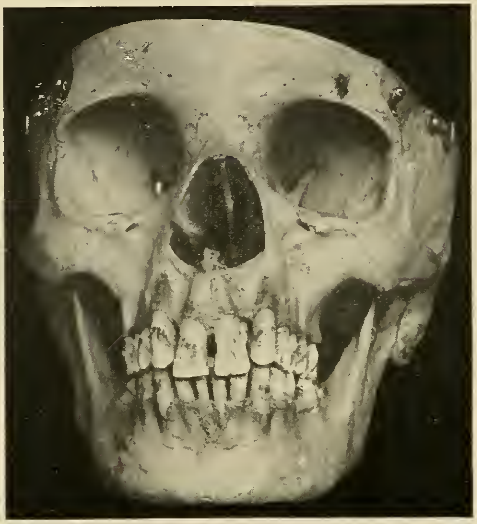


Fig. 4.

When the dermoid appendages are entirely lacking at birth, and do not develop later on, the alveolar process will also be lacking.

The Intermaxillary Suture.

The processes in front which push down and forward are called fronto-nasal; those on the side, maxillary and mandibular; those situated deeply within the face are known as spheno-ethmoid prolongations. It is the general tendency of these buds forming the upper and lower jaws to send processes toward the median line which form a union with their fellows of the opposite side. The bonds of these unions vary according to circumstances, depending upon their position, function, and the age of the individual. In the interpremaxillary suture there is but the slightest bond between the two halves;

there are no bonds or fibres passing over the suture from one side to the other. The suture is shown by the X-ray to sometimes remain partially open throughout life. During the growing period the bonds of union in the sutures are made of uncalcified connective tissue, and even late in life the X-ray often passes through the suture as the deposit of calcic salts in the tissue is so slight.

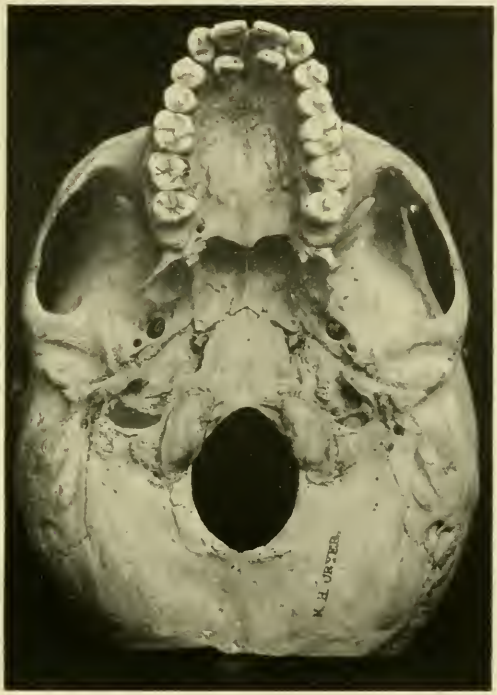


Fig. 5.

Etiology of Narrow Arches.

Keeping in mind this process of development, it is a question whether the narrow dental arch is in itself pathological, or whether it is a morbid anatomical condition produced by an early pathological process, in which case we would find various disturbances and abnormalities in other structures of a similar or closely related development. But whether accepted as a cause or as a result, it is quite certain that an abnormally narrow dental arch is a detriment to the general health, preventing as it does free respiration, drainage and ventilation of the nasal chamber. So there is an urgent necessity for those in charge of the mouth to widen narrow dental arches whenever possible.

Importance of Widening Narrow Arches.

For about thirty-six years, I have recognized the fact that widening narrow dental arches would improve respiration, but I have not observed any evidences that this result was obtained by opening the intermaxillary sature.

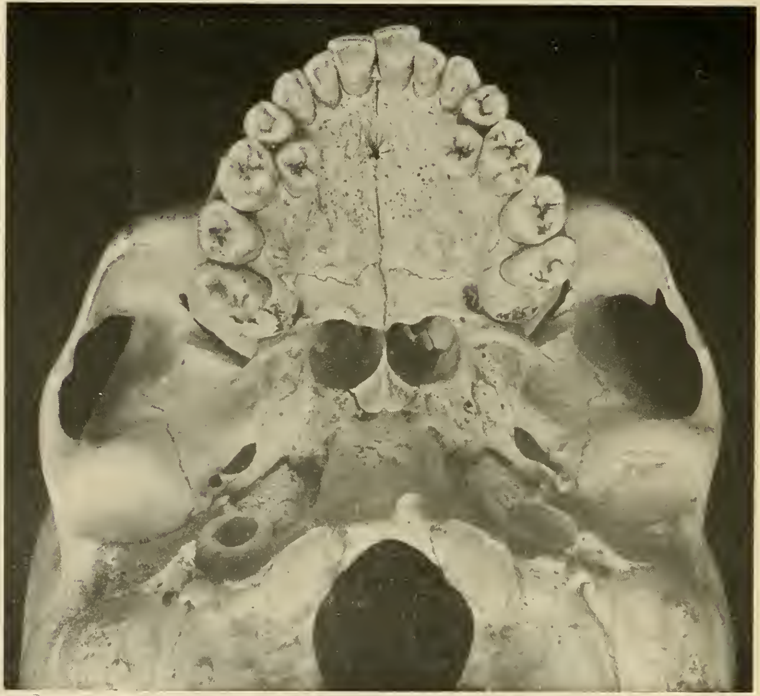


Fig. 6.

The face seems to be built upon a true architectural basis. The intermaxillary suture is so protected and held in position by the facial and cranial bones which act as abutments, with flying buttresses and other braces, that it has always seemed to me to be impossible to open this suture by any force applied to the teeth, especially as the teeth are held in position only by the yielding alveolar process.

A number of pictures have been shown and cases cited by many men of ability, who claim to have opened this suture, but the only optical evidence I have personally been able to find shows that it is the interpremaxillary suture that has been widened, and not the true intermaxillary, which is quite a different thing. Of course, there may be conditions in which the bone is so undercalcified that these braces might yield and permit the separation of the palatal process, but in my opinion this cannot take place when the bones of the face are normally calcified.

Now to come back to the improvement of the general health and respiration by the widening of the dental arches.

Influence of the Tongue in Respiration.

In normal people with normal arches the tongue fills the whole mouth, and extends back into the oro-pharynx almost to the post-pharyngeal wall, against which the soft palate and epiglottis slightly rest. Interfere with the tongue by compressing it between narrow dental arches and you will see that it is forced in the direction of least resistance, which is back into the oro-pharynx. This pushes up the soft palate against the post-pharyngeal wall, cutting off respiration through the nose and blocking drainage and ventilation of the same. As the tongue forces the epiglottis downward and back it also interferes with oral respiration, which, however, is a little easier than nasal respiration under these circumstances; hence, "mouth breathing." Now, when the dentist spreads these narrow arches, it gives more room for the tongue, which moves forward, taking its normal position, and in

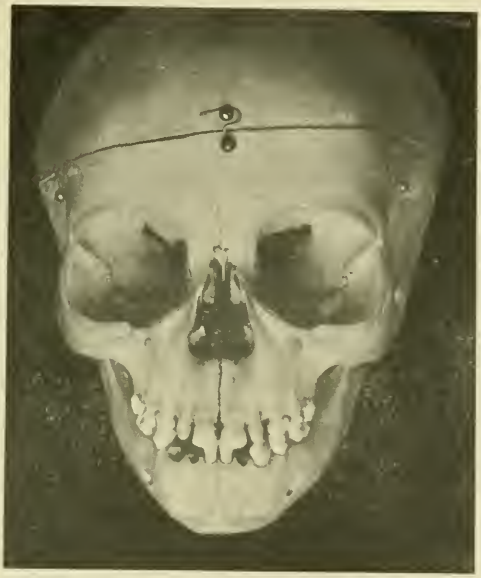


Fig. 7.

turn releases the pressure on the soft palate and other structures, thus permitting nasal respiration, thorough ventilation and drainage, all of which conduces to an improved condition of the general health. This, gentlemen, is in my opinion the reason why spreading the dental arch is so beneficial, not because, as some think, the intermaxillary suture is opened and the floor of the nose widened, but because the unruly tongue is given the room it requires, and is not pushed against the soft tissue at the back of the mouth.

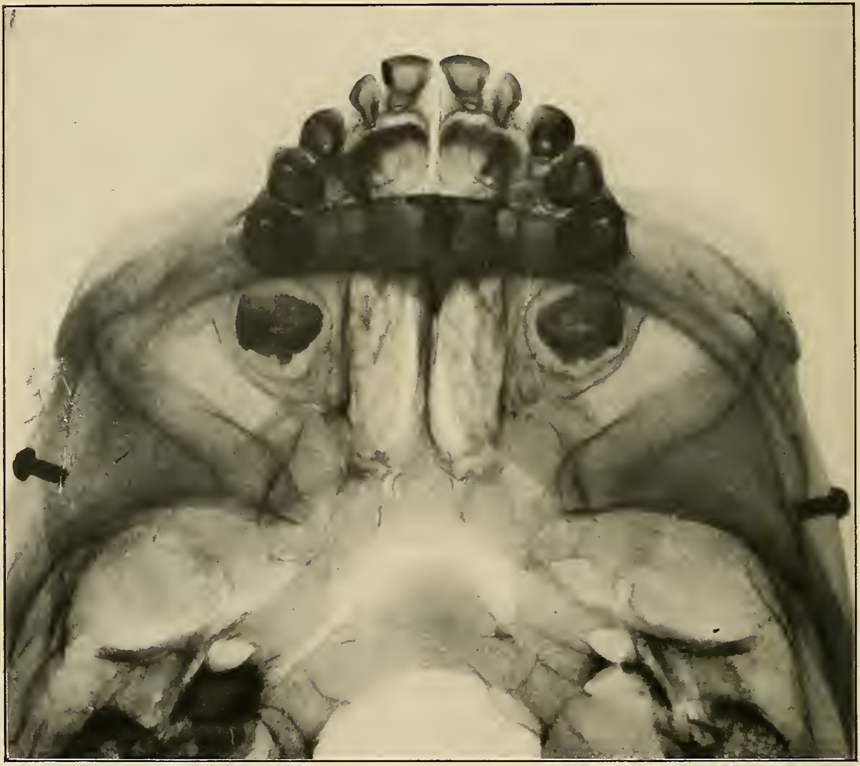


Fig. 8.

The following illustrations will make clear the various points I have endeavored to bring out:

Fig. 1 is made from the skull of a person about 20 years of age, showing its under surface, without the mandible. It is not necessary to go into a detailed description of the specimen to the members of this society, but I would like you to observe the position of the intermaxillary suture, extending from the interpalatal suture to the anterior palatine fossa. The malar processes, the malar bones, and the zygomatic arches, with their attachments to the sides of the brain case, form the lateral abuttments, which are braced in addition by the pterygoid processes and the vertical plates of the palate bones. These bones are permanent structures, and are of comparativly hard tissue, quite different from the alveolar process, whose function it is to hold the teeth in position, often for a short time only. From a study of the architectural perfection of these structures as they hold the true maxillary bones firmly in position, does it seem probable that this suture could be opened by a force applied to the teeth, placed as they are in the yielding structure of the alveolar process?

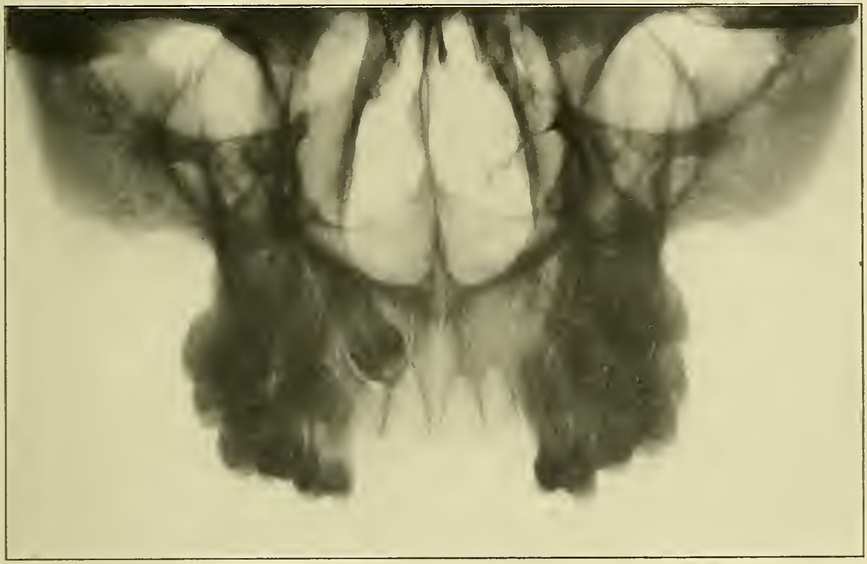


Fig. 9.

Fig. 2 is made from the skull of a child 4 or 5 years of age. It shows the seven sutures in the roof of the mouth, which is the number usually found. The one extending from the horizontal plates of the palate bones to the anterior palatine fossa is the intermaxillary suture under consideration. Three other sutures radiate from this fossa. That going forward between the two central incisor teeth is known as the interpremaxillary suture, and is the one so often confused with the intermaxillary suture.

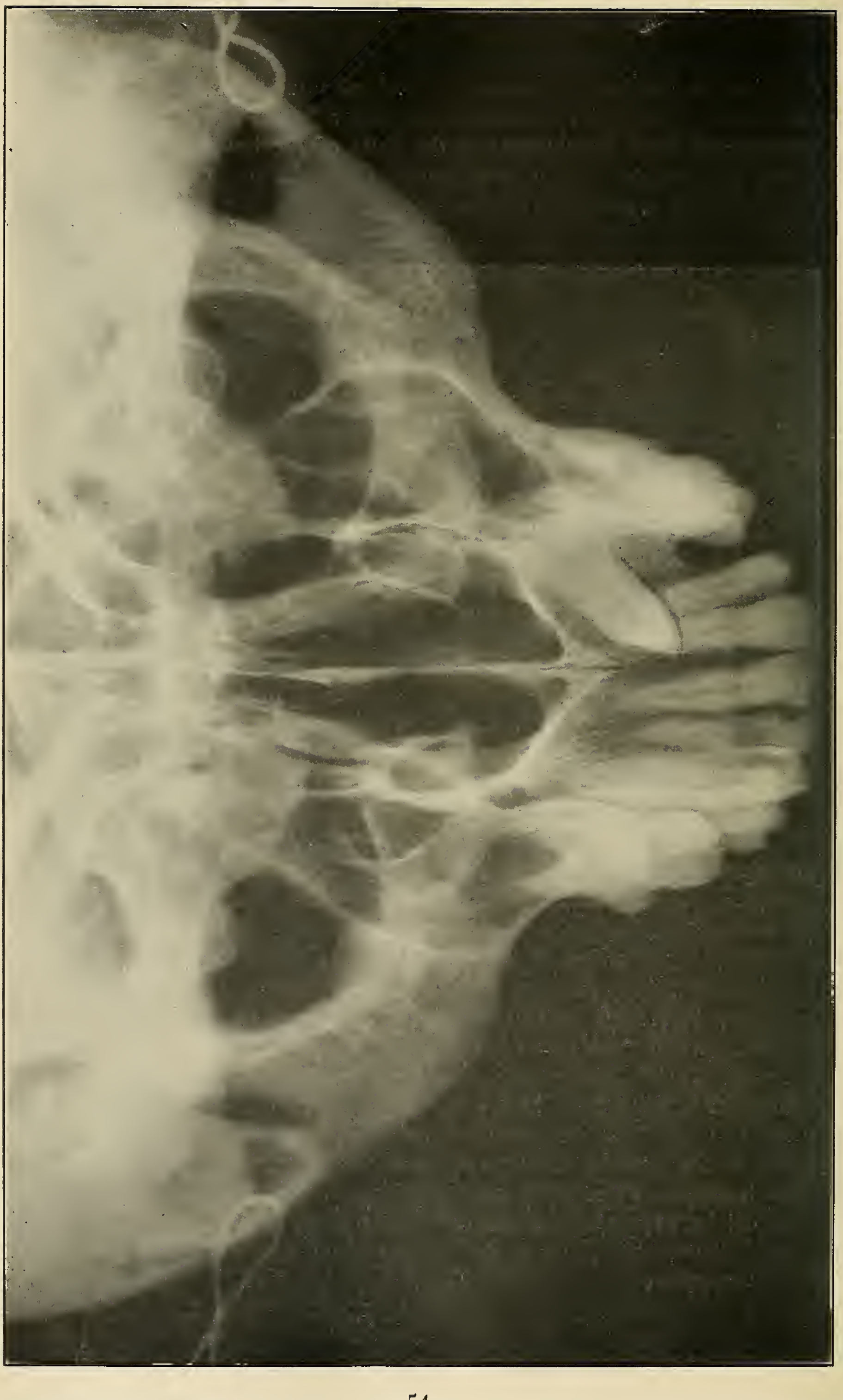


Fig. 10.

In a paper read before this society on June 12, 1901, Prof. Paul Albrecht spoke of more than seven sutures, among them being two passing between the central and lateral incisors. Fig. 3 would support this view.

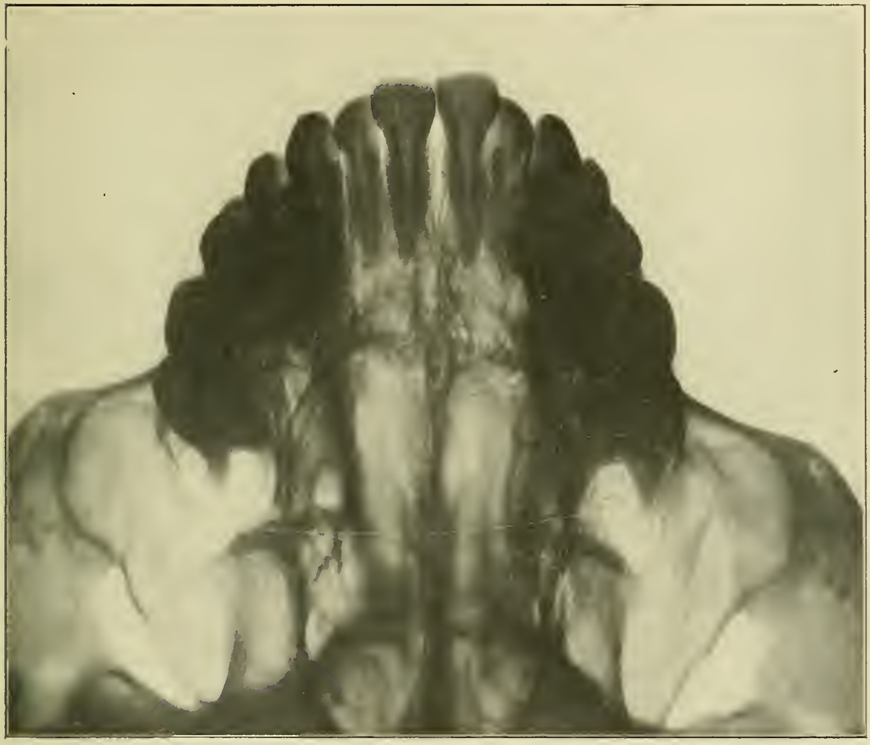


Fig. 11.

Fig. 4 is made from a skull showing that the lateral incisor teeth are missing from their usual position; the alveolar processes of the two central incisors are well defined; the suture between them shows the lack of bonds of union. The alveolar processes belonging to the canine teeth are well marked, and to a lesser degree the processes belonging to the other teeth.

Fig. 5 is a palatal view of the same skull. It shows the lateral incisors almost posterior to the centrals, and in the skull their alveolar processes are seen to distinctly surround the teeth.

Fig. 6 is from a skull that has two misplaced second premolars. Their alveolar processes are well shown surrounding the roots of the teeth. It is from this skull (see Fig. 11) that the X-ray apparently indicates the median palatal suture slightly open throughout its length; also the palato-maxillary sutures.

Fig. 7 is made from an anterior view of the same skull, shown in Fig. 2. It shows the interpremaxillary suture quite open, more than likely without the use of any mechanical appliances. The two premaxillary bones are not held firmly in position at this time of life. The fibres of union passing from either of the premaxillæ to the true maxilla are very slight, and on the external surface only.

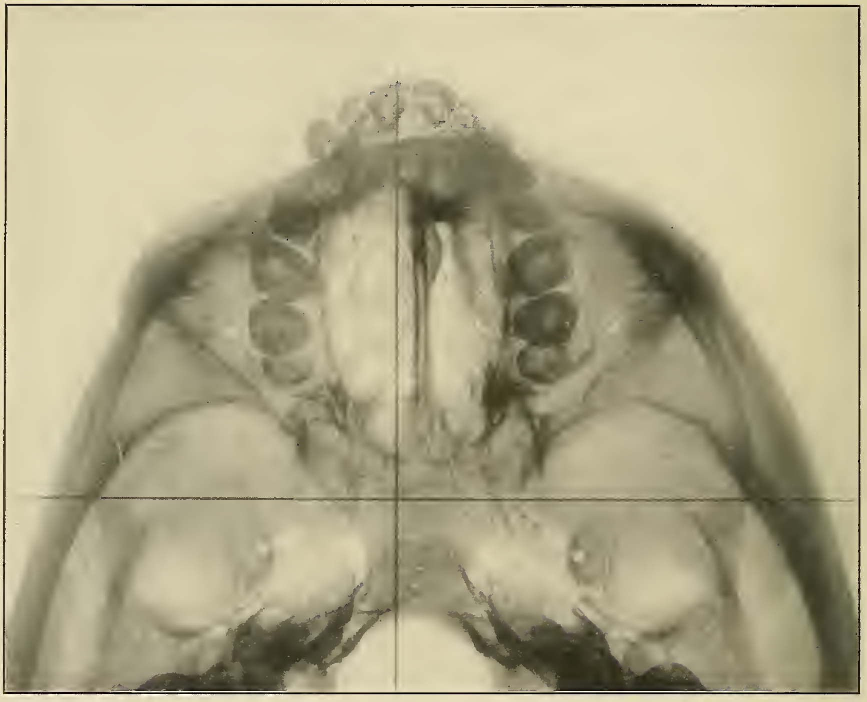


Fig. 12.

Fig. 8 is made from an X-ray picture of the same skull, as Figs. 2 and 7. This shows the interpremaxillary suture quite open. It is somewhat similar to those shown by Dr. Barnes and others, but in this case there is no evidence that mechanical force has been used to open the suture.

Fig. 9 is taken from an X-ray of an aged skull, showing that the interpremaxillary suture has never closed.

Fig. 10 is somewhat similar to Fig. 9. The skull has a fairly wide arch and an open interpremaxillary suture, which, however, did not prevent the impaction of a canine tooth. Many skulls with wide arches have impacted teeth.

Fig. 11 is similar to Figs. 9 and 10. It shows a wide dental arch with two impacted first premolars. The X-ray picture shows that there is a space between the premaxillary bones and also between the true maxillæ. It also indicates the position of the sutures between the horizontal plates of the palate bones and the true maxillæ. These sutures appear to be open in radiographs, because the connective tissue within the sutures is not fully calcified and does not sieve out the X-rays.

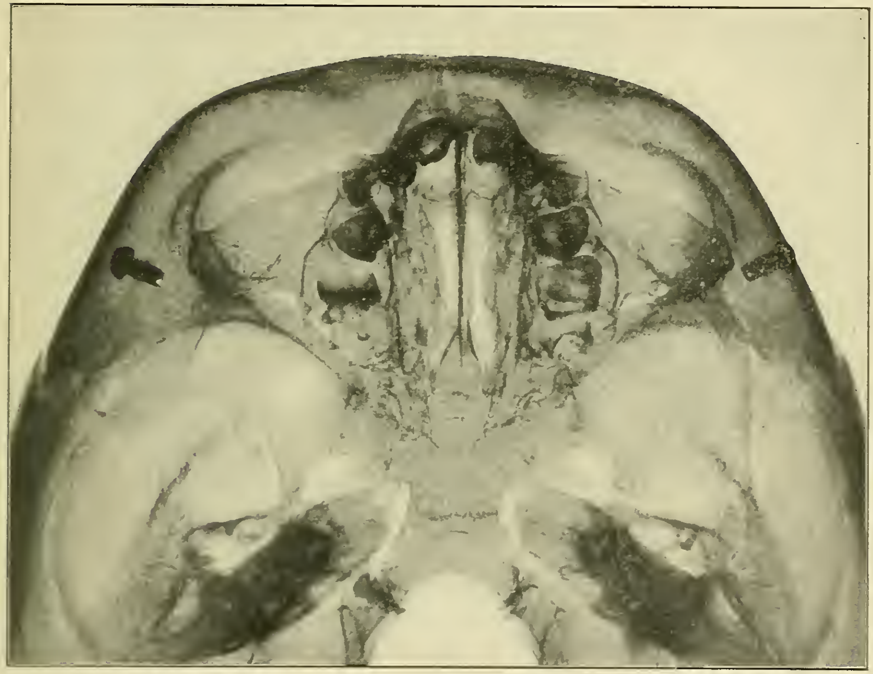


Fig. 13.

Fig. 12 is made from an X-ray picture of an adult showing a very slight shadow of the roof of the mouth with the portion of the median palatal suture apparently open. Some writers claim in similar pictures that the dark lines shown on each side are the walls of the sutures, whereas, as a matter of fact, they are the shadows of the two plates of the vomer. The darkened shadows that appear in the roof of the mouth are caused largely by the turbinated bones.

Fig. 13 is made from an X-ray picture of a child's skull at about the time of birth. It shows a slight opening along part of the median suture. In the centre there is a dark line indicating the vomer; laterally from the vomer, there appears to be an open space within the nose between the septum and the turbinate bones.

Relation Between Width of Arch and Width of Nares.

Orthodontists and rhinologists generally are under the impression that where there is a narrow dental or palatal arch there will be a correspondingly narrow nasal floor. This is given as one of the reasons for widening the dental arch. Examination of many skulls does not confirm this premise. There are many skulls that have wide palatal arches accompanied by narrow nasal floors. So also are there many skulls in which the arch is narrow and the floor of the nose is wide—one condition apparently accompanying the other.

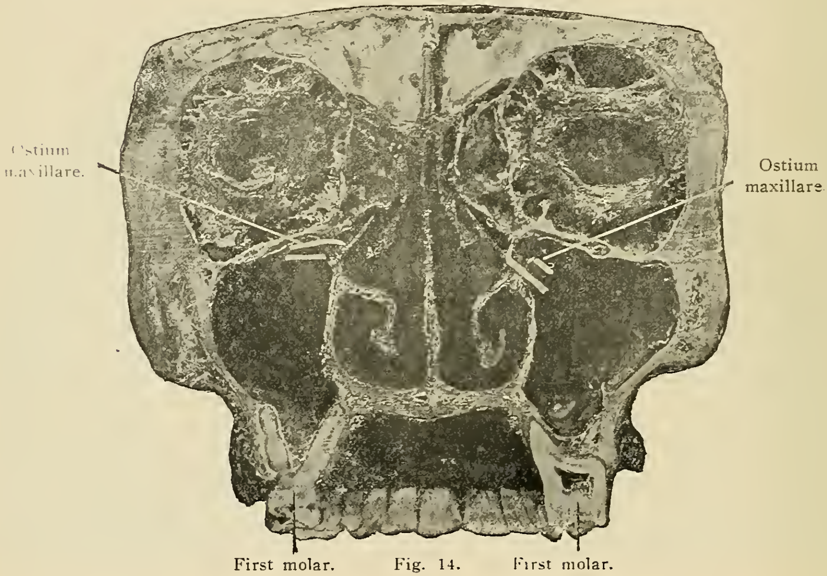


Fig. 14.

A few specimens are here shown in which the measurement of the upper dental arch has been taken between the outer surfaces of the first molar teeth, and the width of the floor of the nose measured at a corresponding point in the same plane. The first two specimens are from what I would term typical skulls, without any marked irregularities. In both of these skulls the width of the floor of the nose is about one-half that of the dental arch measured between the points mentioned above.

Fig. 14 is a vertical transverse bilateral section of a typical skull showing good symmetrical arrangement. The arch is all that could be desired by the orthodontist, while the nasal chamber would be accepted as normal by the most fastidious rhinologist. If all mouths and nasal chambers were like this, the orthodontist and the rhinologist would have little to do except in the case of accident. The dental arch between the outer sides of the first molar teeth measured 58 mm., while the width of the nasal chamber is about half of this, or 29 mm. I find in other typical skulls about the same relative measurements, i. e., the width of the arch about twice that of the floor of the nose. It must be remembered that these skulls were measured in their dry condition.

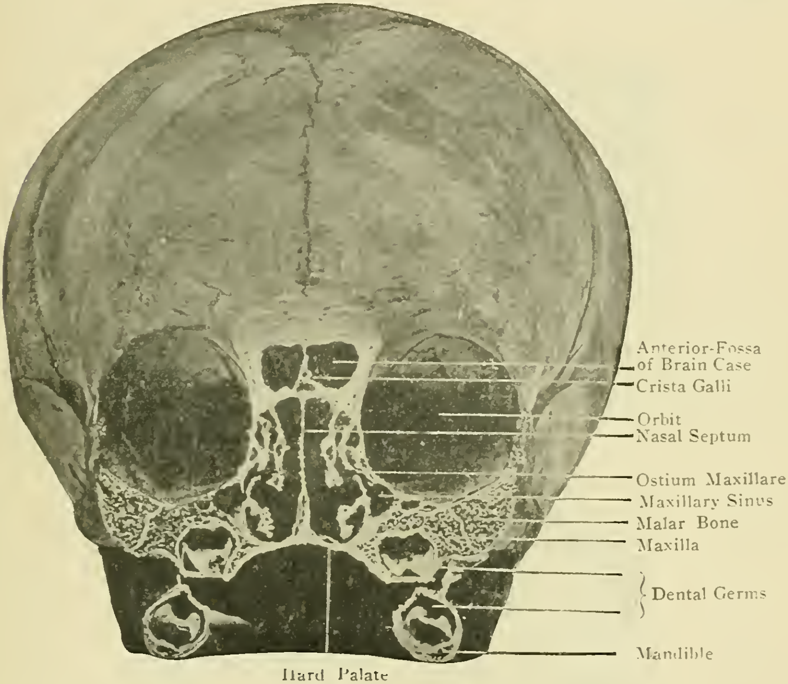


Fig. 15.

Fig. 15 is made from the skull of a child at birth, and shows the same relative measurements.

Fig. 16 shows an arch 70 mm. in width, while the floor of the nose, which should measure 35 mm., is only 26 mm. wide.

Fig. 17 is made from a skull with a very narrow dental arch and a very wide floor of the nose. The dental arch measures 55 mm. between the outer sides of the molar teeth. The floor of the nose, which should be 27.5 mm., is 35 mm.

Fig. 18 is made from a skull with a very wide arch and a narrow compressed nose. The outside measurement of the arch is 66 mm. The nose should be 35 mm., but is only 20 mm. It will be noticed that the maxillary sinuses are very large, which is usually the case where the nose is so narrow. When the nose is wide the antra are often small, or may even be undeveloped.

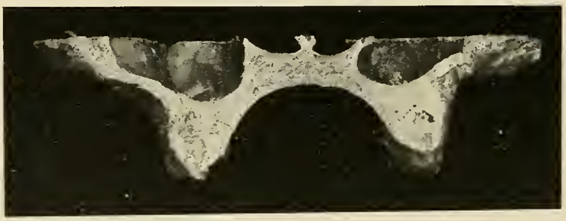


Fig. 16.

Fig. 19 is made from another wide arch and a narrow nose. This skull has five distinct nasal meati.

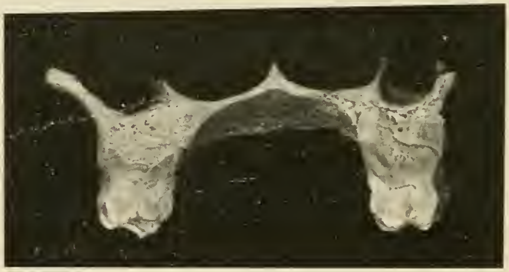


Fig. 17.

Fig. 20 is made from a skull showing one of the narrowest arches in my collection. The width of the arch across the outside of the second premolars is but 44 mm., while the floor of the nose measures 35 mm., one of the widest I have at this point of measurement.

Fig. 21 is from a transverse section of a skull just in front of the first molar teeth, looking forward. The arch is of good width, though narrow at the top, the measurement over the premolars being 55 mm. The floor of the nose measures about 20 mm., and the widest portion of the nose is 32 mm. There are unusually large maxillary sinuses, with a correspondingly narrow nasal chamber. Before the sinuses were cut, each held one fluid ounce and a quarter (about 35 c.c., or together, 70 c.c.). These are the largest antra I have measured or seen. At the point of the section the two antra are but 19 mm. apart, as they virtually pass under the nasal fossa. In the region of the first premolar teeth, the distance between the two antra is about 13 mm. If this man had been unable to breathe through his nose, I think the orthodontist would have found it very difficult to open the intermaxillary suture and widen the nose by applying force to the teeth.

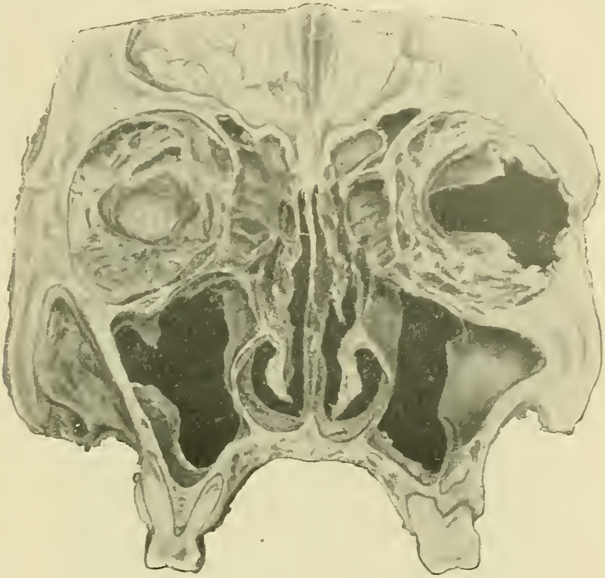


Fig. 18.

The Nose and Mouth as Respiratory Passages.

The following figures illustrate the nose and mouth as respiratory passages.

Fig. 22 is from a vertical transverse bilateral section of a frozen head, cut in the region of the first molar teeth. It gives a good view of the nasal chamber and a cross section of the mouth. The head is fairly symmetrical and shows typical anatomy, the only irregularity being a slight spur on the nasal septum. The nasal chamber is, perhaps, a little narrow, but it is clear and gives plenty of space for respiration. There are very few skulls that do not have sufficient space over the intermaxillary suture for ordinary respiration. It will be noticed that the tongue does not "lie in the bottom of the mouth," as described in Gray's Anatomy, but, as in all normal cases, fills the mouth when the latter is closed, with the exception of a small space under the hard palate. Professor Donder has spoken of this space between the roof of the mouth and the tongue as acting somewhat on the same principle as the vacuum chamber in an upper artificial denture.

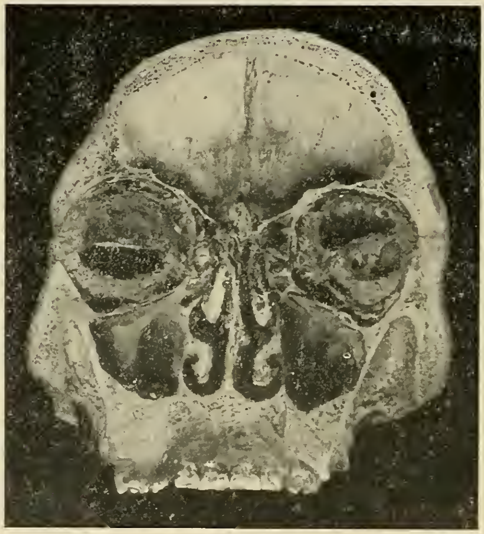


Fig. 19

When the mouth is open the tongue may be said to lie on the floor, so that there is plenty of space for the air to pass back to the glottis. If the mouth be narrow, the tongue does not have the space it requires, and is forced backward against the soft palate, the soft palate being in turn forced backward and upward against the post-pharyngeal wall, closing the naso-pharynx and the fossa of Rosenmüller. The free nasal and oral respiration brought about in these cases by widening the arches is due to the fact that the tongue is given room to come forward, allowing the soft palate to resume its normal position.

It is natural to suppose that the tongue, being so large and strong, would, through its outward pressure, have more or less influence in moulding the shape of the alveolar arches, but from examinations of many vertical bilateral sections of the face, I am inclined to believe that the walls of the mouth have more influence in shaping the tongue than the tongue has in shaping the mouth. If a well-developed mouth with a full denture be examined, it will be seen that the surface of the tongue is smooth and conforms to the contour of the teeth, the alveolar process, and the roof of the mouth. On the other hand, in a compressed face, with a narrow arch, the tongue will be irregular in its outline.

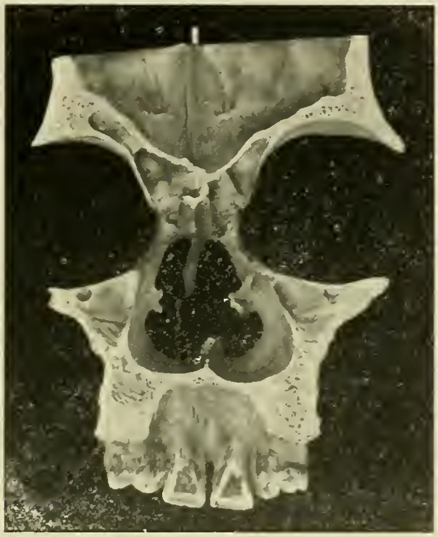


Fig. 20

Fig. 23 is from a sagittal section of a fresh-frozen skull, which gives a true idea of the lateral portion of the nasal chamber, the hard and soft palates, the pharynx, the mouth, the tongue, and the epiglottis, showing their relations to one another. It will be noticed that the central incisor teeth are in good occlusion. The mouth is nearly filled by the tongue, leaving but little space under the arch of the palate. The tongue also extends well back into the oro-pharynx, coming in contact with the soft palate, which is carried backward against the post-pharyngeal wall. The epiglottis at the base of the tongue also rests slightly against the back of the pharynx, leaving but little space for respiration. This space is sufficient when the individual is at rest. During exertion, however, more breathing space is required; the mouth is opened and the space in the pharyngeal region is increased. There is no congestion shown in the nasal chamber; everything is clear, allowing good ventilation and drainage.

If the dental arch of this skull had been narrow, the tongue would have been forced backward against the soft palate and the post-pharyngeal wall, thus cutting off both nasal and oral respiration, and both of these air passages could have been relieved only by opening the mouth and carrying the tongue downward and forward with the mandible. This is what occurs in many cases of so-called "mouth-breathing." Mouth-breathing is not always caused by adenoids or obstruction of the true nasal passages, but often by narrow dental arches.

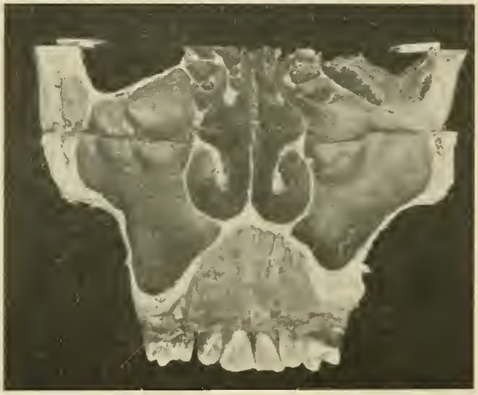


Fig. 21.

Fig. 24 is made from a bilateral section of a frozen head. It shows that the face is narrowed and compressed until the maxillary sinus of one side (the right) is lacking, while the other is but rudimentary, as in early embryonic life. It will be noticed that while the internal structures of the face are very much compressed, the floor of the nose is of fairly good width. The septum is crooked. The arch of the mouth is very narrow in proportion to the floor of the nose. The mandible is also narrowed, consequently the tongue is very much compressed and out of shape and is forced backward into the pharynx, thus cutting off respiration, especially when the mouth is closed.

Fig. 25 is from a vertical transverse section of the same skull as that shown in Fig. 24. This shows a very much compressed condition of the structures surrounding the oro-pharynx. The uvula is twisted, the tonsils, the epiglottis and the larynx are out of shape from pressure of the tongue, produced, not by a narrow floor of the nose, but by a narrow dental arch. It must have been difficult for this man to

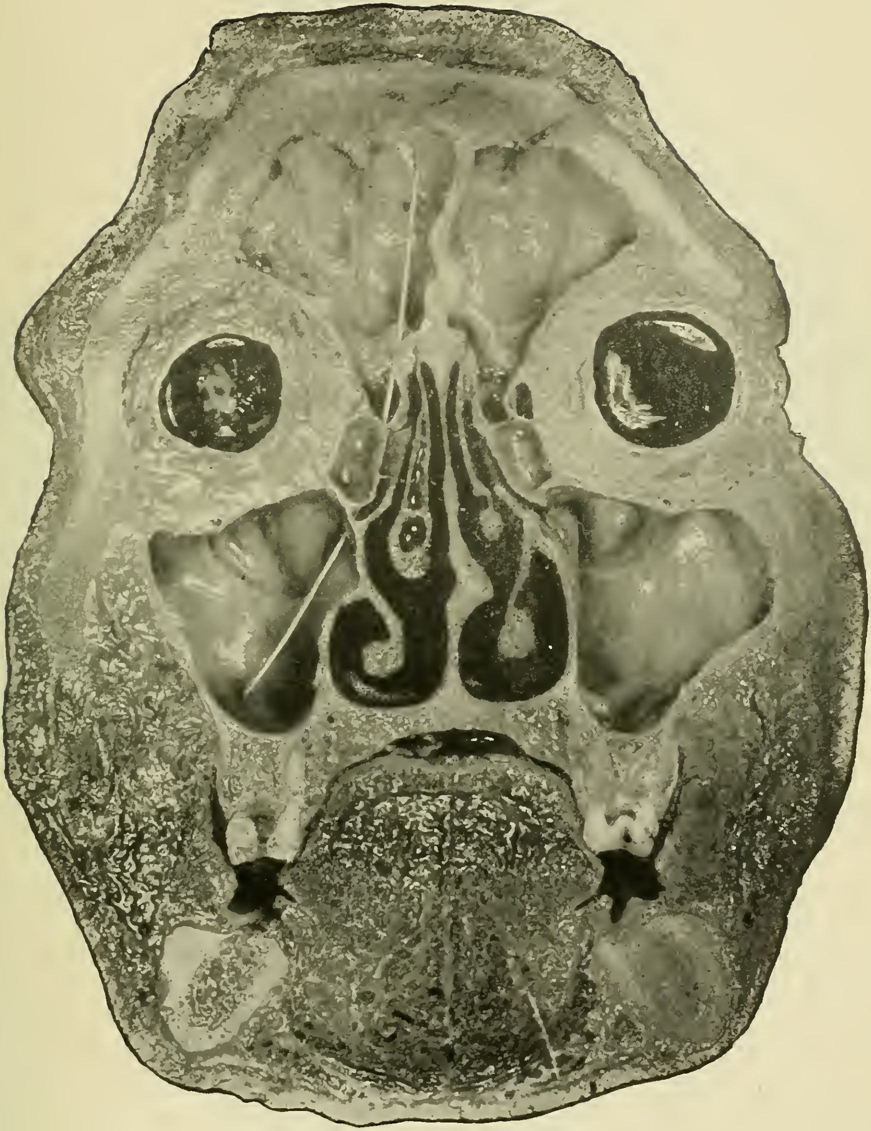
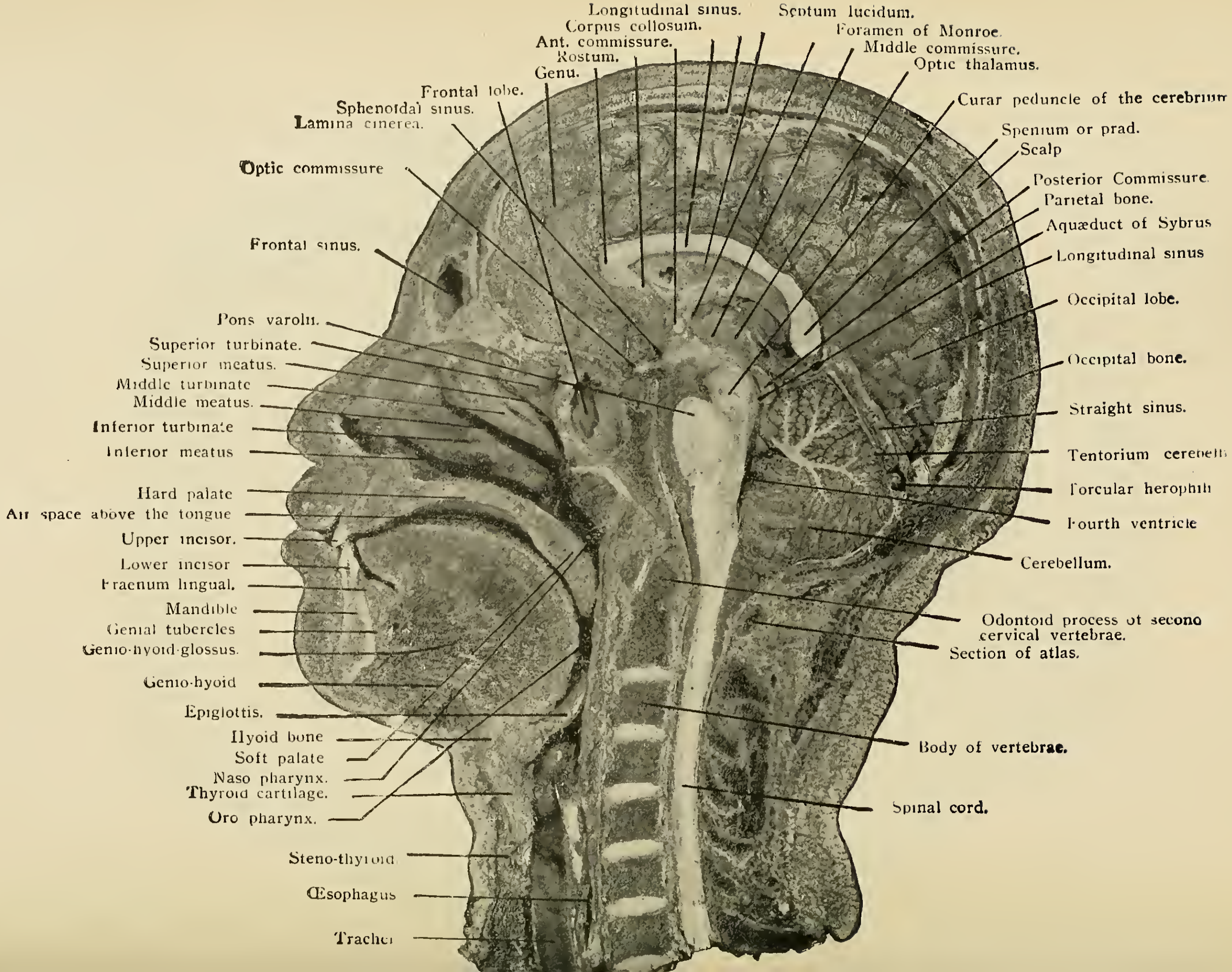


Fig. 22.


Longitudinal sinus.
Corpus collosum.
Ant. commissure.
Rostum.
Genu.
Frontal lobe.
Sphenoidal sinus.
Lamina cinerea.
Optic commissure
Frontal sinus.
Pons varolii.
Superior turbinate.
Superior meatus.
Middle turbinate
Middle meatus.
Inferior turbinate
Inferior meatus
Hard palate
Air space above the tongue
Upper incisor.
Lower incisor
Fraenum lingual.
Mandible
Genial tubercles
Genio-hyoid-glossus.
Genio-hyoid
Epiglottis.
Hyoid bone
Soft palate
Naso pharynx.
Thyroid cartilage.
Oro pharynx.
Steno-thyroid
Œsophagus
Trachea
Septum lucidum.
Foramen of Monroe.
Middle commissure.
Optic thalamus.
Curar peduncle of the cerebrum
Spenium or prad.
Scalp
Posterior Commissure.
Parietal bone.
Aquæduct of Sybrus
Longitudinal sinus
Occipital lobe.
Occipital bone.
Straight sinus.
Tentorium cerebelli
Torcular herophili
Fourth ventricle
Cerebellum.
Odontoid process of second cervical vertebrae.
Section of atlas.
Body of vertebrae.
Spinal cord.

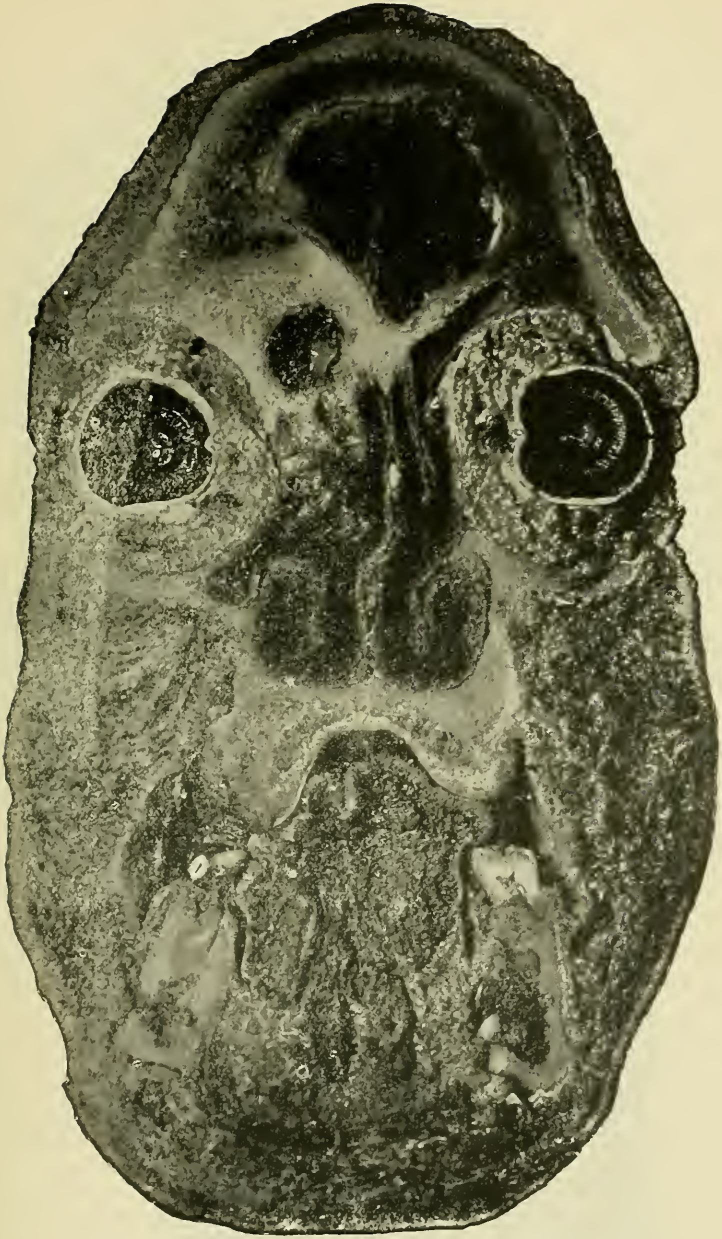


Fig. 24.

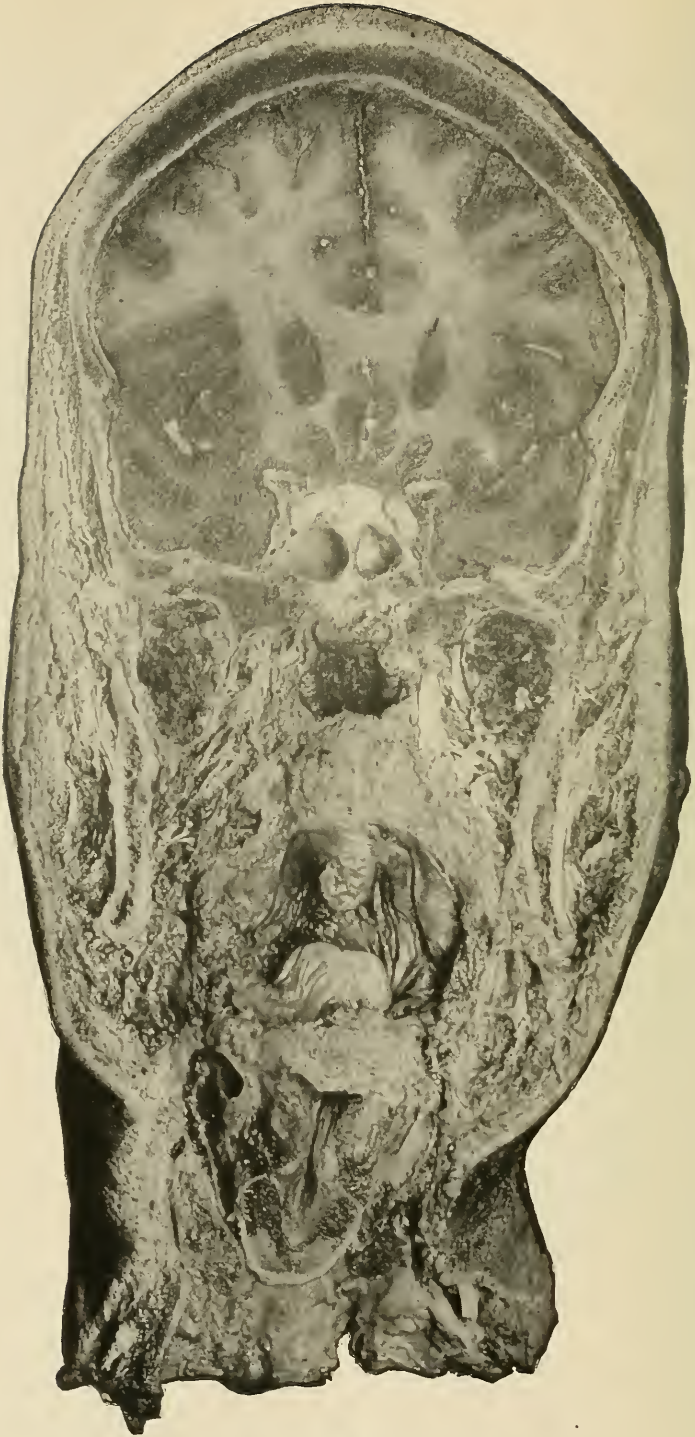


Fig. 25.

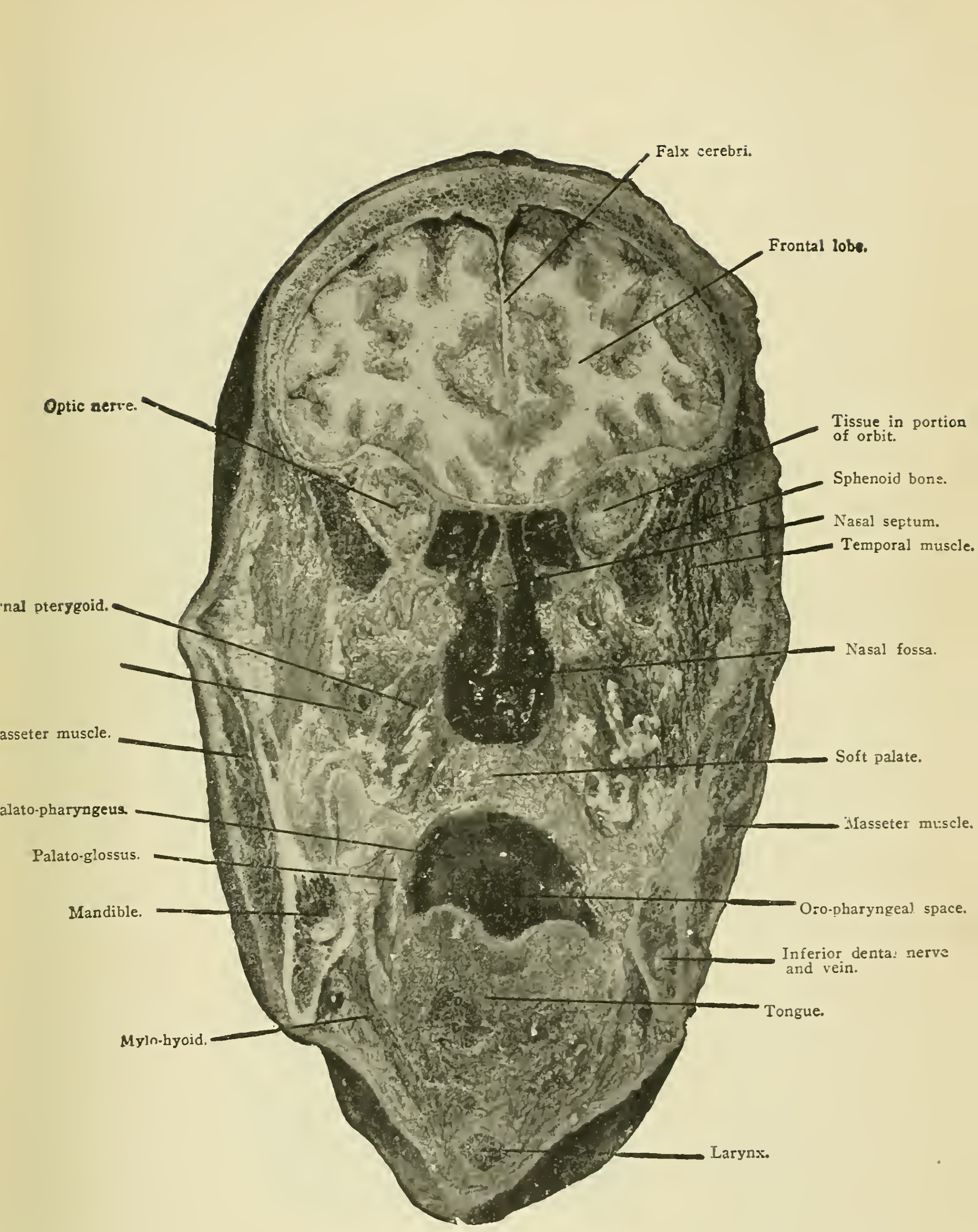

Falx cerebri.
Frontal lobe.
Optic nerve.
Tissue in portion of orbit.
Sphenoid bone.
Nasal septum.
Temporal muscle.
rnal pterygoid.
Nasal fossa.
asseter muscle.
Soft palate.
alato-pharyngeus.
Masseter muscle.
Palato-glossus.
Oro-pharyngeal space.
Mandible.
Inferior dental nerve and vein.
Tongue.
Mylo-hyoid.
Larynx.

Fig. 26.

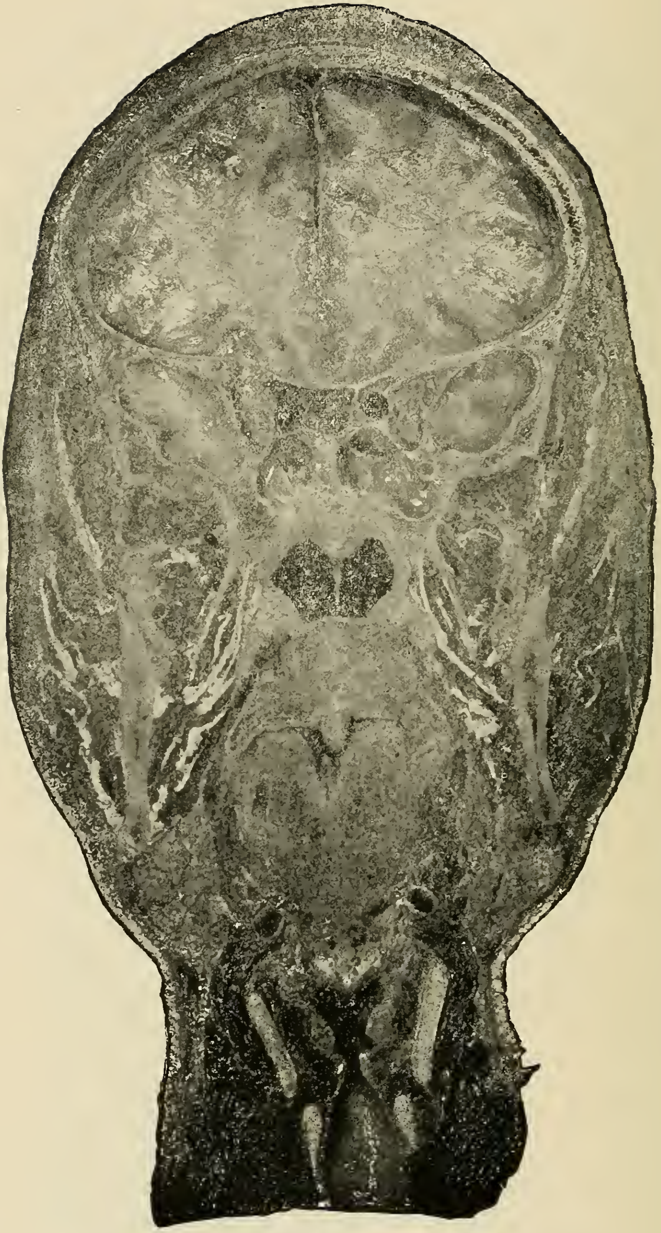


Fig. 27.

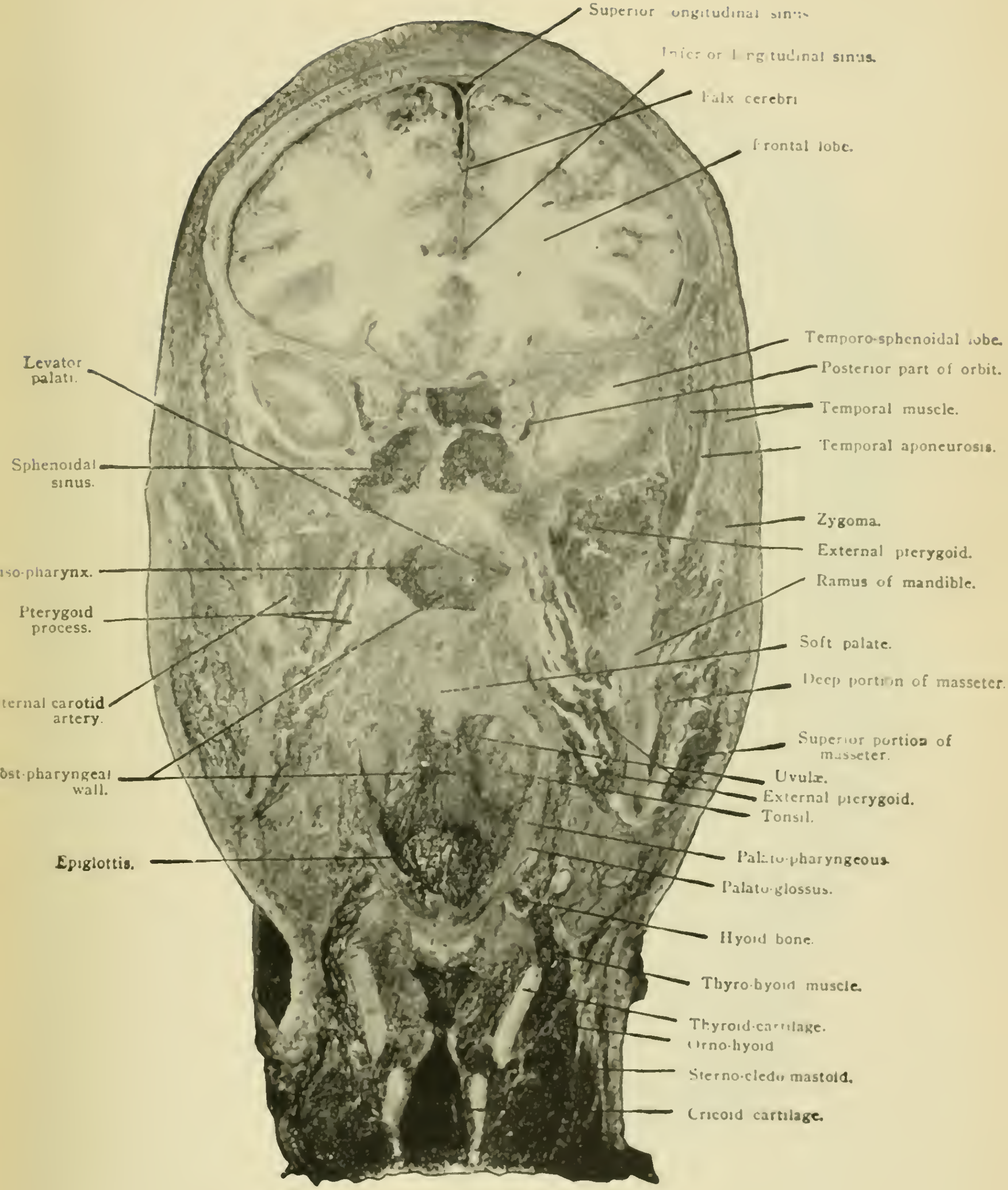

Superior longitudinal sinus
Inferior longitudinal sinus.
Falx cerebri
Frontal lobe.
Temporo-sphenoidal lobe.
Posterior part of orbit.
Temporal muscle.
Temporal aponeurosis.
Zygoma.
External pterygoid.
Ramus of mandible.
Soft palate.
Deep portion of masseter.
Superior portion of masseter.
Uvulæ.
External pterygoid.
Tonsil.
Palato-pharyngeous.
Palato-glossus.
Hyoid bone.
Thyro-hyoid muscle.
Thyroid-cartilage.
Omo-hyoid
Sterno-cledo mastoid.
Cricoid cartilage.
Levator palati.
Sphenoidal sinus.
iso-pharynx.
Pterygoid process.
ternal carotid artery.
ost-pharyngeal wall.
Epiglottis.

Fig. 28

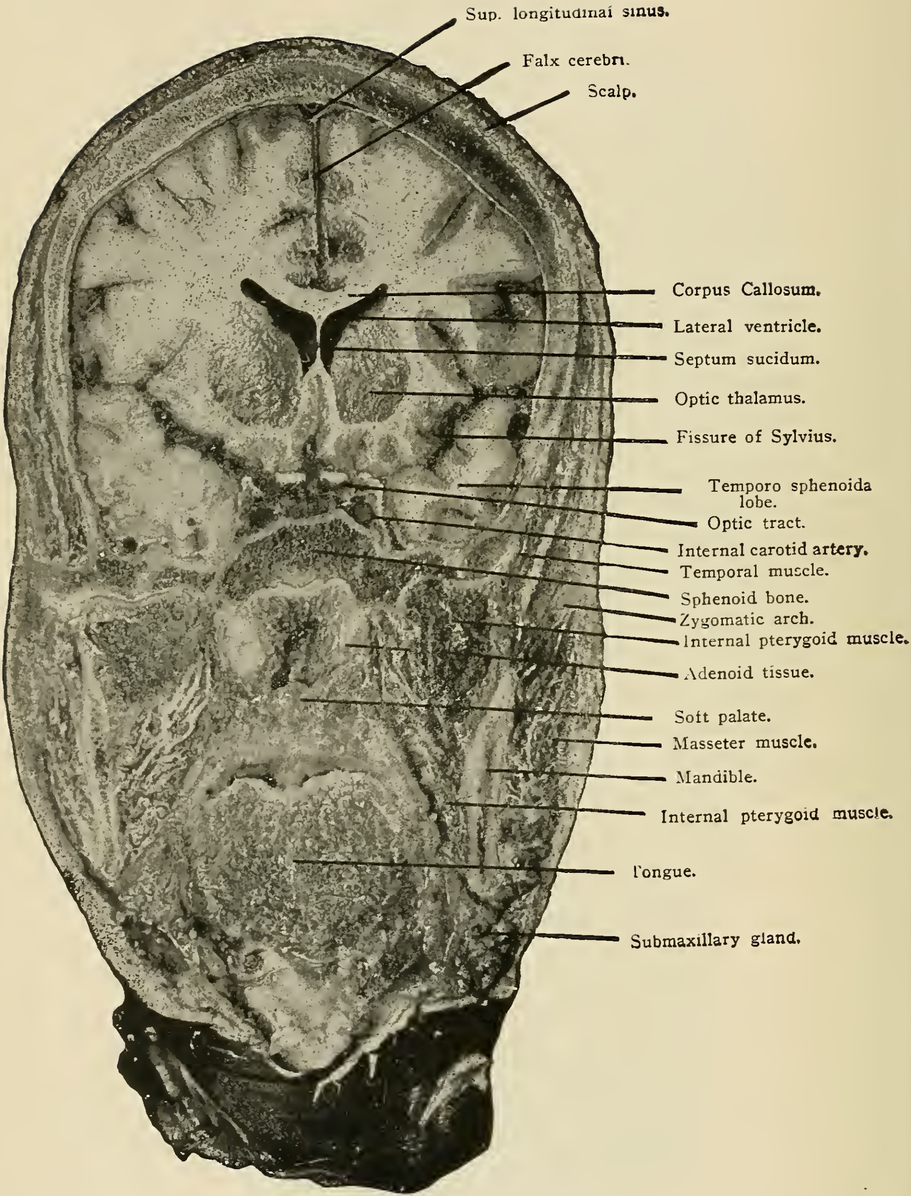

Sup. longitudinal sinus.
Falx cerebri.
Scalp.
Corpus Callosum.
Lateral ventricle.
Septum sucidum.
Optic thalamus.
Fissure of Sylvius.
Temporo sphenoida lobe.
Optic tract.
Internal carotid artery.
Temporal muscle.
Sphenoid bone.
Zygomatic arch.
Internal pterygoid muscle.
Adenoid tissue.
Soft palate.
Masseter muscle.
Mandible.
Internal pterygoid muscle.
Tongue.
Submaxillary gland.

Fig. 29.

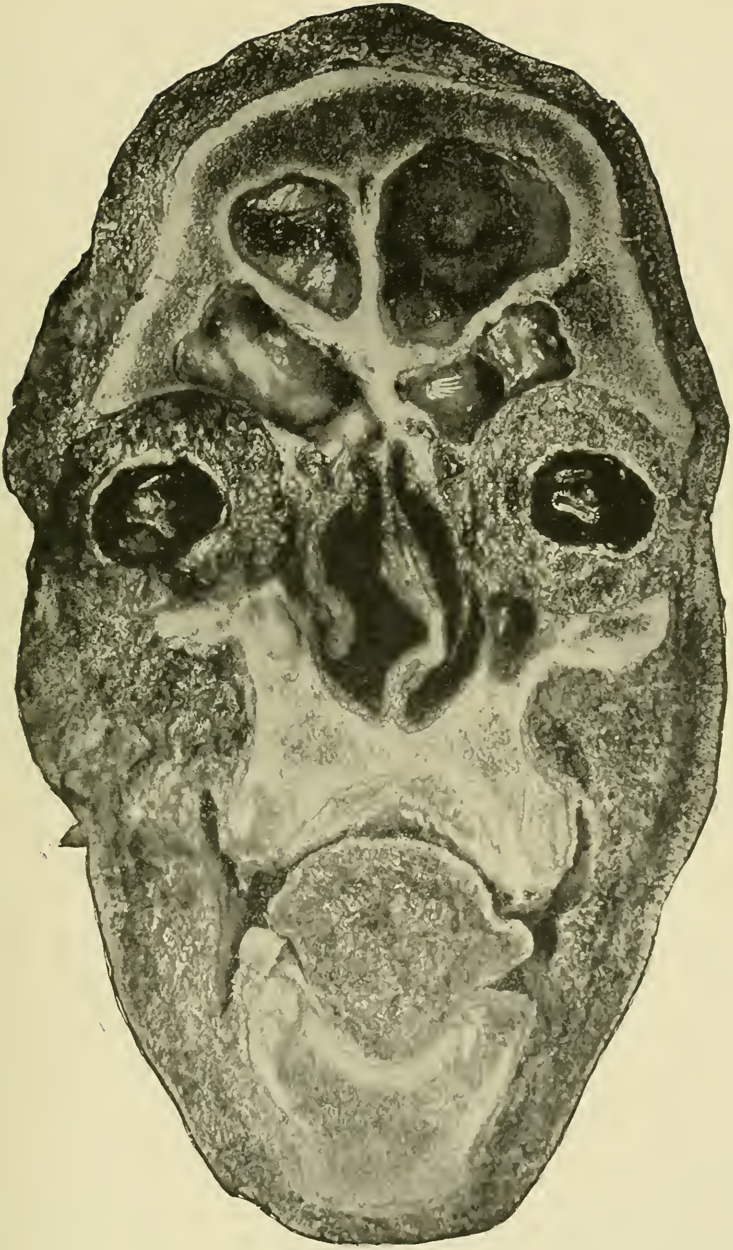


Fig. 80.

carry on free respiration, and impossible for him to perform the deep breathing required by great exertion. This morbid condition brings a further congestion and thickening of the mucous membrane of the nose and its accessory sinuses. If the dental arches be widened in this case, permitting free nasal respiration, drainage and ventilation, the congestion of the soft parts will disappear and there will in this way be greater width to the nose and improved general health, not because the intermaxillary suture is opened (which it is not), but because the tongue is liberated and given room.

Fig. 26 is made from a bilateral vertical section of a frozen head cut in the region of the posterior portion of the hard palate. The subject died with the mouth open, and it had not been closed before the section was made. The anterior portion of the larynx is shown. From near the larynx it will be noticed that the fibres of the mylo-hyoid muscles pass upward and outward to the internal oblique lines of the mandible. If these muscles are kept in a state of tension, the angles of the mandible will be drawn towards each other and thus tend to contract the lower portion of the face. Comparison of this illustration with Fig. 22 will show great differences in regard to these muscles. In this specimen (Fig. 26) the palato-glossus and palato-pharyngeus muscles are placed on tension, narrowing the distance between the right and left tonsillar spaces. This action of the muscles in this region naturally influences the narrowing of the face, as also does the lack of percussive force of the lower teeth against the upper.

Fig. 27 gives a view of a transverse bilateral section, showing the naso-pharyngeal space free from adenoids. This soft plate, the uvula and the posterior portion of the tongue are in good position. It will be noticed that the tongue and the soft palate are close together. Below the tongue and a little to one side, a cross section of the hyoid bone will be observed, and below this are cross sections of the thyroid and cricoid cartilages, showing the inlet of the larynx and trachea. If the posterior portion of the tongue be removed, the tonsillar space will be brought in view, as shown in Fig. 28. In this illustration the uvula will be seen in the centre, with the post-pharyngeal wall immediately below it. On each side of the uvula are the tonsils. At the bottom of this space the anterior portion of the epiglottis is seen. Its general shape deflects the passage of fluids from the mouth to the sides of the pharynx. Everything indicates ample space for both nasal and oral respiration.

Fig. 29 is from a vertical transverse bilateral section of a frozen skull made in the region of the anterior portion of the soft palate. The passageway of the posterior nares is nearly closed. The post-pharyngeal wall is partly seen above the soft palate, and the uvula is shown. It is very evident that when the adenoids are present, as shown in the picture, nasal respiration would be very difficult. Of course there is a cause for these adenoids, and I am inclined to think that narrow dental arches will be found to be responsible in the majority of the cases. Adenoids induce mouth-breathing, and if the mouth is kept open there is a tendency to compress the arches. If we look at Fig. 30, taken from the same skull as Fig. 29, only more anteriorly, we find the dental arches very narrow, the mouth partly opened with the tongue compressed, seeking room even out toward the cheeks. It also shows a deflected septum. Here is a marked case of the "vicious circle," difficult respiration through the posterior nares causing the mouth to be kept open, which produces a narrowing of the arches, the narrow arches in turn force the tongue back against the soft palate, which still further shuts off nasal respiration, drainage and ventilation, causing again abnormal mouth-breathing.

I would like to say again in conclusion, that it is most important that abnormally narrow dental arches should be carried out to a normal width. Whether one thinks that the intermaxillary suture is opened in so doing, or whether one believes that it is not, makes little difference. The main point is that the narrow arches should be widened and the tongue allowed to come forward, which will relieve the obstruction of the pharynx, permit freer respiration, drainage and ventilation, and also relieve the congested condition of the erectile tissue and mucous membrane of the nose, accessory sinuses, and ducts. This will in turn assist in giving breathing space, improve olfaction, and in some cases give better hearing, thus breaking up the vicious circle produced by narrow dental arches.

Discussion of Dr. Cryer's Paper.*

By Geo. V. I. Brown, A.B., D.D.S., M.D., C.M.
Oral Surgeon St. Mary's Hospital and Children's Free Hospital, Milwaukee, Wis.

By way of introduction to my discussion of Dr. Cryer's paper, entitled "The Influence Exerted by the Dental Arches in Regard to Respiration and General Health," it gives me pleasure to take this opportunity to express my personal indebtedness to Dr. Cryer for the valuable assistance that I have received in the course of the development of my surgical work from his wonderfully painstaking and instructive anatomical studies. In common with practically all others who treat surgically the region of the buccal cavity and the maxillæ, or the nose and the nasal accessory sinuses, the ear and associate parts, I owe much to Dr. Cryer for being among the first to break ground in the direction of supplying absolutely exact demonstrations of actual anatomical conditions as they exist, normally and abnormally. I am fully in accord with his statement that "great improvement can be brought about in respiration, both nasal and oral, by widening the dental arches," and certainly there can be no question as to the value of such a result when it is remembered that, as he also states, "this will produce change for the better in the nasal cavity and its accessory sinuses with the drainage and ventilation of these spaces, all of which will tend to improve the health of the patient." We may further agree with his statement that this improvement can take place, regardless of the opening of the suture in the region of the maxillæ, but I believe that the essayist himself and all others will agree with me that if the median palatine suture can be opened by a process so simple as pressure across the palate, and by this means the nasal cavities made actually wider, that the likelihood of all these great results will be greatly enhanced thereby, and both the promptness and effectiveness of local as well as general benefit would be much more certain. The question before us to-day then is, "Can this be accomplished as described, or is such a result impossible?" We may accept even, as a Mohammedan relies upon the truth of the Koran, any statement which Dr. Cryer would make with regard to the anatomy of the respiratory tract, and his brief review of the development of the upper and lower jaws is beyond doubt in accord with the best knowledge obtainable on the subject.

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*Dr. Brown was absent from the meeting and his contribution was received by the Board of Censors too late to be used with the regular discussion. Dr. Cryer's paper appeared in the January issue.

Curiously enough, however, the protection given the median palatine suture by the facial and cranial bones, which Dr. Cryer calls attention to as acting "as abutments with flying buttresses and other braces," and which, as he views them, has always made it seem to him to be impossible to open this suture by a force applied to the teeth, offered to me the reasons why I felt reasonably hopeful in first undertaking to open the suture by the use of an appliance making pressure against the teeth, across the palate, because I felt that this very resistance made it possible for pressure thus applied to be manifested in the higher region of the maxillary and associated bones, as, according to well-known laws of mechanics, might not be expected in like degree if the teeth and alveolar processes were allowed to spread out without any such resisting external force. It seems to me that the following paragraph, quoted from Dr. Cryer's paper, offers a somewhat unnecessary danger of confusion in discussion by the use of the terms inter-maxillary suture and inter-premaxillary suture:

"A number of pictures have been shown and cases cited by many men of ability who claim to have opened this suture, but the only optical evidence I have personally been able to find shows that it is the inter-premaxillary suture that has been widened, and not the true inter-maxillary, which is quite a different thing. Of course there may be conditions in which the bone is so under-calcified that these braces might yield and permit the separation of the palatal process, but in my opinion this cannot take place when the bones of the face are normally calcified."

This confusion may be avoided by adopting the following terms used in the Sobotta-McMurrich *Atlas and Text Book of Human Anatomy*, according to which the suture throughout the central division of the hard palate is called the median palatine suture. The anterior portion of the median palatine suture as thus recognized is that which divides what was originally the os incisivum, or premaxilla; its posterior extremity includes the division between the palate bones; its middle portion represents the points of contact between the palatine processes of the superior maxillary bones in the central portion of the palate and the inter-maxillary suture is the central division between the alveolar processes of the maxillæ that

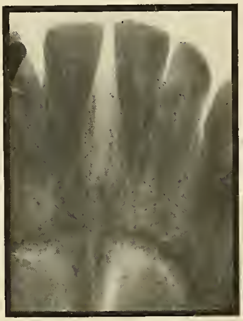


Fig. 1.

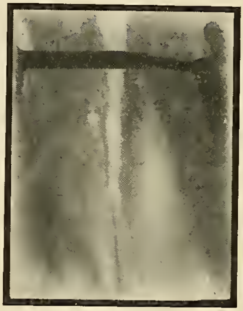


Fig. 2.

Fig. 1. Radiograph of the palate of a boy 13 years of age as it appeared approximately seven days after the use of the appliance was begun.

Fig. 2. Radiograph showing the palate of a young man 18 years of age with the maxillary bones separated after approximately seven days' pressure across the palate against the teeth on each side.

extends from the incisor teeth up to the nose. (Sobotta-McMurrich—*Atlas and Text Book of Human Anatomy,* p. 78, Figs. 100-38.)

Undoubtedly, when the appliance used to accomplish expansion of the dental arch has been one that has made its principal and most active pressure close to the anterior part of the mouth, as has evidently been the case in a number of instances when the published skiagraphs have shown a marked separation between the maxillæ in the anterior portion of the median palatine sture, the effect of the pressure is most apparent at that extremity of the suture. But there appears to be no good reason to believe that the bones would separate so much more easily in this region, where the area of their contact is greater and the bones thicker, than more posteriorly where the bones are thinner and often not completely united by bone structure provided that the pressure be applied at a point farther back in the palate, instead of at its anterior portion. The skiagraphs shown in Figs. 1, 2, 3, 4, all indicate that the suture has been opened throughout its entire length. It appears to be impossible to prevent distortion in making radiographs to show the palatine suture; moreover, it is found that there is a wide diversity of conditions of the median palatine suture when large number of cases are studied by the use of the

X-ray. But granting, as everyone must, that this suture in most individuals is not completely and absolutely united until well on toward middle life (sometimes not even then), and also that, as the essayist states, the malar processes, the malar bones and the zygomatic arches, with their attachments to the side of the brain case, form the lateral abutments, and that these do exert a counter pressure when force is applied against the teeth across the palate, then it seems to me a very natural result for one to expect separation along the line of this not firmly united division through the center of the palate. From my point of view, Dr. Cryer's illustrations, Nos. 2 3, 4, 5, 6, 7, 8, in so far as it is possible for me to determine by description alone without opportunity to study them, each one and all together seem to prove the feasibility of the plan for utilizing this method of securing nasal improvement by separating the superior maxillary bones at their palatal articulation.

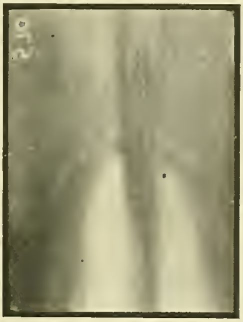


Fig. 3.

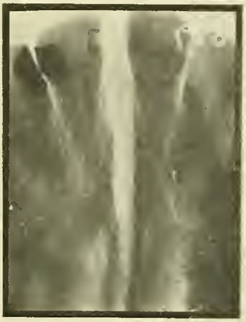


Fig. 4.

Fig. 3. Radiograph of the mouth of a young man 29 years of age taken more than two years after wide separation of the superior maxillæ for the relief of nasal conditions. The thick black central line shows the development of a new bone along the line of the median palatine suture.

Fig. 4. Radiograph of the palate of a young man 18 years of age. In this case pressure was applied July 21st and stopped August 3rd. During this period approximately two days' time was lost because it became necessary to reset the appliance. Total time applied pressure less than twelve days.

In detailed reference to Dr. Cryer's slides we find the points which he has described with reference to his Fig. 1, I have already referred to as opposite in effect, according to my view.

The seven sutures noted in his Fig. 2 apparently leave little room for doubt that pressure across the palate would easily separate the several divisions of the bones involved in such cases, or that this effect would widen the nares by actual increase in size as well as through improved respiration.

The difference between the use of terms as Dr. Cryer prefers them and the Sobotta-McMurrich anatomy previously referred to is apparent in his description of this illustration. Dr. Cryer defines the sutures as follows: "The one extending from the horizontal plates of the palate bones to the anterior palatine fossa is the inter-maxillary suture under consideration. Three other sutures radiate from this fossa. That going forward between the two central incisor teeth is known as the inter-

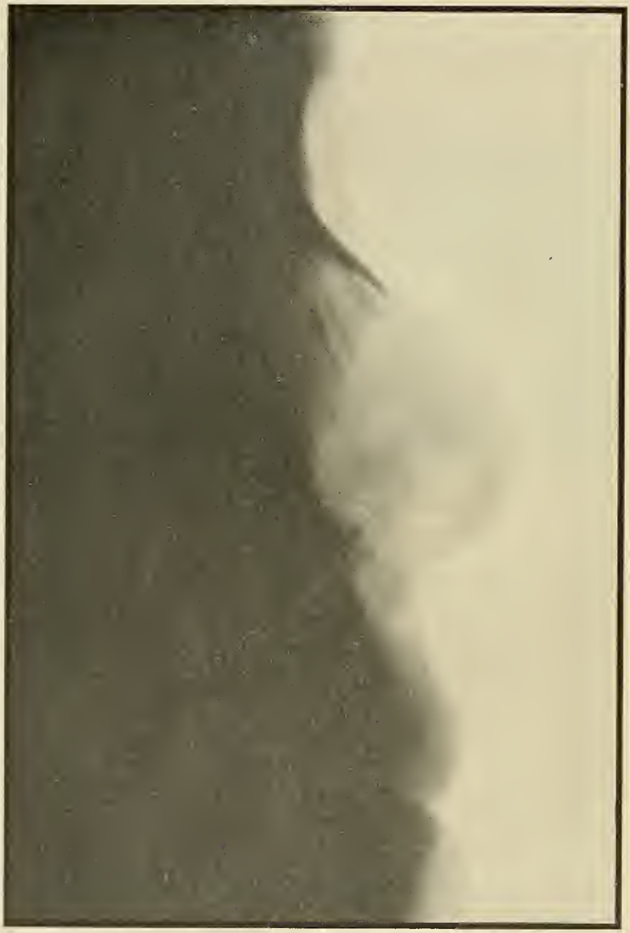


Fig. 5.

Profile view of the boy whose palate is shown in Fig. 1. The separation between the nasal process of the superior maxillary and the nasal bone on the exposed side is plainly indicated by the broad light line. The widening of the nose was distinctly noticeable from the anterior aspect at this time.

premaxillary suture, and is the one so often confused with the inter-maxillary suture."

As already noted, according to the authorities quoted, it is the median palatine suture and not the inter-maxillary suture that extends longitudinally through the central portion of the palate, the inter-maxillary suture being the one that extends upward between the central incisor teeth through the alveloar process to the nasal cavity.

Beyond doubt, many authorities agree with Dr. Cryer, who is himself an unquestionable anatomical authority, but I feel that the use of the terms as given by Sobotto and McMurrich will, to some extent at least, tend to avoid confusion, such as Dr. Cryer states often occurs in describing this suture.

Figures 3, 4, 5, 6, 7, 8, all show this suture open or lightly held; certainly they present no bar to separation by pressure.

Enlargement of Nasal Passages Claimed.

Doubtless there are many factors that are influential when spreading the dental arch to give better nasal respiration and improved health, and among them the altered position of the tongue, as Dr. Cryer has so perfectly and originally described it; but this cannot altogether account for the increased size of the nares as ascertained by actual examination and measurement by disinterested rhinologists and others, as proven by my own cases, practically all of which have been double checked in this way through a long series of years; or the measurements reported from intra-nasal records by Dr. Wright, of Boston, whose wonderfully accurate instrument for this purpose seems to leave no room for question in this regard; or the nasal results reported by other investigators that have from time to time been recorded; or the following record of Dr. L. W. Dean, of the State University of Iowa, for a girl about seventeen years old whose median palatine suture I separated (as we believe) and for whom the measurements were made by an instrument devised by Dr. Dean for this purpose with a view of eliminating in so far as possible any inaccuracies that might be due to altered or transitory conditions of the soft tissues of the nose. These measurements were taken in an absolutely disinterested way by an associate of Dr. Dean's, who knew little if anything of the purpose of my appliance, or our expected results from its use.

It will be seen that they absolutely do away with any possible question as to enlargement being confined to the anterior portion of the nose, such as would have been expected if only the extreme anterior portion of the median palatine suture has been separated as suggested by Dr. Cryer:

	A May 28, 1909		B Aug. 11, 1909		C Feb. 18, 1910	
	R.	L.	R.	L.	R.	L.
Ant. end Inf. Turb. to Sep....................	5	6	8	9	9	10
Middle of Inf. Turb. to Sep....................	5	4	7	6	7	6
Post. end Inf. Turb. to Sep....................	10	12	10	12	12	12
Ant. end Mid. Turb. to Sep....................	2	2	2	2	4	4
Mid. of Mid. Turb. to Sep....................	1	2	2	2	2	4

It is a matter of deep regret to me that I have not had an opportunity to examine the specimens shown in Dr. Cryer's other illustrations, for, judging by his measurements and descriptions, I feel that he has shown much that cannot fail to have a far-reaching effect upon our future knowledge of the actual relation of the mouth-to-nose conditions, and these in turn as influencing other parts and organs, as well as the organism as a whole, thus rendering treatment more scientific.

Influence of the Tongue.

His references to the size and shape of tongues in relation to the forms of dental arches and palatal vaults are of particular interest, and will, I am sure, lead to improved methods of investigation, because during the past few years, since I have been led to more or less systematic observations of the forms of the tongues of my patients, on account of the possible influence of this factor in speech defects and training, I have been struck with the opportunities that this field of study offered, and have come to realize that its results might be of inestimable value.

In making the application to actual vital nasal conditions of records made upon dry or even frozen specimens, it must be borne in mind that in the former those structures which are most subject to pathologic change are absent, and in the latter there is also absent the possibility of the rapid alterations that are noticed in hypertrophic states of intra-nasal tissues in living subjects which unquestionably alter the results as presented by post-mortem records of measurement.

After approximately fifteen years continuous experience in widening dental arches by rapid expansion, for the purpose of enlarging the nares through separation of the median palatine suture, or, as I have previously called it, "readjustment of the maxillary bones," with almost invariably satisfactory results in giving at least a measure of intra-nasal relief, it is with surprise that I note a more or less marked tendency among orthodontists to question the practicability of this simple process; the more so because the idea is not new. Undoubtedly most of those who regulated teeth according to older and perhaps somewhat cruder methods have occasionally been more or less alarmed by the unexpected parting of the central incisors through separation of the maxillary bones. Usually references that have been made to this condition were formerly along the line of caution against its occurrence.

Previous Claims As to Opening the Median Suture.

Dr. Clark L. Goddard, in Kirk's *American Text Book of Operative Dentistry* (the second edition of which was published in 1900), makes the following reference:

"*Separation of the Superior Maxillæ at the Symphysis.*—When strong pressure is applied upon molars and bicuspids to spread the arch the superior maxillæ may be separated at the symphysis. Such separation was first recorded by Dr. E. C. Angell, of San Francisco, in 1885, and has been noticed by Guilford, Black, Talbot, Farrar, Ottolengui, and others since. (C. L. Goddard, Second Edition Kirk's *American Text Book of Operative Dentistry*, p. 698.)

Bogue and other operators with whom I have discussed the subject describe having had similar experiences. Dr. F. M. Willis, of Utica, N. Y., in the *Dental Cosmos* (July, 1911, pp. 784-86), gives a very clear description of some cases in which successful results were obtained through separation of the maxillary bones for patients of Dr. J. S. Kirkendall, of Utica, N. Y., and Dr. Varney Barnes, of Cleveland, Ohio, has also contributed much evidence in this direction.

In my own early practice I have sometimes been quite seriously alarmed by having caused it inadvertently. The first case in which I performed this operation for the specific purpose of immediately increasing the width of the nares in a case of almost total deafness, in order that Dr. Nelson M. Black, of Milwaukee, might be able to catheterize the Eustachian tubes to relieve the aural condition, has been widely reported, as have many cases since treated in association with many rhinologists in many parts of this country. In fact, so many such results have been published, or otherwise recently reported, that only a passing notice is practicable at this time.

In support of my own belief I offered the following summarized evidence in proof that it is at least well founded:

1. Large numbers of cases in which, within a period of approximately seven days to two weeks, the central incisors have moved apart without the direct application of any force whatever to these teeth, and in which, according to the reports after examination by rhinologists, there was corresponding improvement in the intra-nasal conditions, with evidence of increase in the size of the nasal chambers. Among these were many cases of recognized disease of the nasal accessory sinuses, which gave evidence of such prompt improvement through better drainage that the shortness of time alone would seem to preclude the possibility of this benefit being brought about in a more indirect manner.

2. I have demonstrated by the use of a green skull that force applied across the palate can be made to separate the median palatine suture

through its entire length and also the intra-maxillary suture, and that the width of the nares can thus be actually increased.

The pictures of a green skull thus treated have been widely published, and the head itself, with these sutures separated and the appliance in place, was exhibited at the meeting of the American Medical Association in Chicago, in connection with a paper read before the Section of Stomatology of that Association. Moreover, the actual separation was accomplished in the presence of reliable witnesses. This statement appears to be called for because I have been given to understand that others have not been successful in accomplishing a like result. Personally, I do not consider this a very accurate test. There are many conditions pertaining to the character of the specimen, the nature and direction of the force applied, as well as other questions, that may tend to alter the results in this kind of demonstration. It did, however, prove that when separation does take place along the line of these sutures, as a result of force applied across the palate, it is complete, and the nasal chambers are correspondingly widened.

3. I have had one case of fracture due to an accident with a motorcycle, the jar of which forced the lower jaw against the upper in such a manner as to force the maxillæ apart. In this case the maxillary bones were so widely separated that the overlying muco-periosteum was torn apart. The primary object in sending for me was to have the palatal fissure closed. This, however, was unnecessary as soon as the bones were pressed together again. I have also been called into consultation in one other similar case in which there was separation of the median palatine suture as a result of an automobile accident. In both these cases there was fracture of other facial bones, which appeared to have been occasioned by the forcing apart of the upper maxillæ as a result of the traumatism. Each appeared to establish the fact that the force accidentally applied immediately parted this suture, just as occurs when an appliance is used for the purpose.

4. In one of my patients, a little girl about eight or nine years old, the forcible straightening of the nasal septum by the injudicious use of a nasal splint forced the lower edge of the septum down through the median palatine suture until its lower border could be felt upon the palate surface.

5. Not infrequently there is a marked depression, sufficient at least to indicate the absence of bone tissue that may be noted by external examination above the central incisors when they have moved apart in the course of maxillary separation as described, and occasionally in the central portion of the palate the change in the central suture may be recognized by digital examination. The line along this division may also at times be observed in an impression of the mouth, taken immediately after the

removal of the appliance, when for any reason a wide separation of the maxillary bones had been necessary.

6. The patients themselves almost invariably recognize the difference in nasal breathing, and this improvement occurs when other evidences indicate that the nose has been widened and the volume of air correspondingly increased at each inhalation. The degree of the change is naturally governed by the condition of the nasal mucous membrane, which may be rapid or slow or variable in its response.

7. Patients also commonly report feeling the effect of pressure in the malar and nasal region when the nut is turned tightly after the maxillæ have separated.

8. Rhinological examination almost invariably discloses that there has been an immediate enlargement of the breathing space. Practically all such patients in my practice are referred to rhinologists for examination as soon as the incisors are moved apart sufficiently to warrant the belief that there will be a noticeable change within the nose.

9. The X-ray gives pictures such as Figs. 1, 2, 3, 4.

10. Fig. 3. The radiograph of the central portion of the palate of a man 28 years old, whose upper maxillæ were widely separated because of marked intra-nasal deformity and nasal disease, associated with pathologic conditions of the nasal accessory sinuses and debilitated general state, which made him practically incapable of even reasonably continuous mental or physical effort (all these symptoms have since almost entirely disappeared), taken two years after his mouth was expanded, shows a dark, broad line, which seems to indicate that bone has been developed along the line of the interspace between the bones separated through the median maxillary suture, just as one would be led to expect would occur under any other similar condition.

11. The outward appearance of the nose in many cases is changed by the altered positions of the bones. Sometimes the nasal bones appear to be carried apart, so that the broadening of the nose is apparent to the naked eye and the separation can be felt along its anterior surface. In other cases the broadening seems to occur along the line between the sutures of the nasal bones and the nasal processes of the superior maxillary bones. Fig. 5. A radiograph of the nose of a boy eight years old, taken in profile, shows a distinct line of separation between the nasal process of the superior maxillary and nasal bone on the exposed side, and corroborates the conclusion that a change in the relation of these bones has occurred, as indicated by the external appearance of the boy's nose.

Dr. Cryer's Reply to Dr. Brown.

It was unfortunate that Dr. Brown was not at the Chicago meeting when the paper was read, so that he could have seen the slides as they were thrown on the screen and minutely described. He has seen neither the slides nor the specimens from which they were made.

Dr. Brown speaks of confusion in the names given to the sutures of the upper jaw, saying: "This confusion may be avoided by adopting the following terms from the Sobotta-McMurrich *Atlas and Text Book of Anatomy.*" I regret that Dr. Brown prefers the nomenclature of this work to that of the generally accepted American and English anatomies, as many of the terms in this book have not been translated to conform with English usage. For instance, in Plate No. 38, referred to by Dr. Brown, the inter-premaxillary suture is called the inter-maxillary suture, while in Plate No. 100, also mentioned by Dr. Brown, it is called a portion of the median palatal suture. Again, in Plate No. 100, the term inferior orbital fissure is used, which to us is known as the spheno-maxillary fissure—a much better name, explaining as it does the location of the fissure between the sphenoid and the maxilla. The zygomatic process of the maxilla, which we know as the malar process, is also spoken of, and so on throughout the book. Dr. Brown speaks of the "os incisivum, or premaxilla," as though the two were synonymous. I think this is a mistake. The inter-maxillary bone, or os incisivum, is formed by the two premaxillary bones, which usually contain the incisor teeth or their germs. I have the strong feeling that when we are the proud possessors of the works of such men as Allen, Leidy and Piersol, it is rather a mistake to go gunning in foreign fields.

In order that we may be understood as speaking of the same thing, I wish to state that throughout my paper when using the term "inter-maxillary suture" I mean the suture that passes between the true maxillæ, and when speaking of the inter-premaxillary suture I mean the suture that passes between the premaxillary bones throughout life, regardless of teeth or alveolar processes. By the median palatal suture I mean the entire suture beginning at the free margin of the hard palate or posterior nasal spine, passing forward between the palate bones, thence between the true maxillæ to the anterior palatine fossa, then forward between the premaxillæ and terminating at the anterior nasal spine.

I am much gratified that in the main points of the paper Dr. Brown and I are in accord. I think he fully agrees with my statement that the widening of narrow dental arches allows the tongue to move forward, taking its normal position, thus relieving the obstruction of the pharynx, permitting free respiration, drainage, and ventilation, and also relieving the congested condition of the erectile tissue and mucous membrane of the nose, accessory sinuses and ducts, all of which gives better breathing space and olfaction, and in some cases even improving the hearing.

Dr. Brown also agrees that the inter-premaxillary suture may be widened, as his X-ray pictures, Nos. 1, 2, 3 and 4 indicate. We do differ, however, in regard to the widening of the inter-maxillary suture, and Dr. Brown's pictures *do not show that this can be done.*

I wish the doctor could have seen the X-ray slides used in illustrating my paper, which showed apparently a marked opening of the entire median palatal suture. This appearance, however, was only due to the passing of the rays through the thinly calcified bone along the suture, as exhibited by the specimens on subsequent examination, demonstrating that X-ray evidence cannot be accepted on this point.

Dr. Brown refers to several cases under certain numbers as 1, 2, 3, etc. In regard to paragraph No. 1, it is not at all difficult to understand why the inter-premaxillary suture is opened in cases of this character. When one thoroughly knows the construction and development of the internal anatomy of the face it is easy to understand why the incisor teeth and their processes separate and spread apart when a mechanical force is applied to the teeth in order to widen the dental arch. Each tooth has its own alveolar process; these processes are bound together by connective-tissue fibres, which vary in their number and strength of union in different parts of the circumference, becoming less strong in the process belonging to the canine and lateral incisor teeth, while between the two central incisors there are no bonds of union; consequently, when a force is applied the circumference must increase by the stretching of the connective-tissue fibres of the alveolar processes, and as the median line or inter-premaxillary suture is the weakest point, it naturally opens when sufficient force is used, while the inter-maxillary and inter-palatal sutures are so well braced by other structures of the face that they do not open unless there is something radically wrong with the skull.

In regard to paragraph No. 2, in which Dr. Brown speaks of having opened the entire median palatal suture in a green skull, I can only say that I had hoped to see this or similar skulls at Chicago, and would be very glad to see one at any time.

In reference to paragraph No. 3, again I agree with the doctor that severe injury might cause the opening of the median palatal suture. In a case that came under my notice, a railroad yardman has his head caught between two car buffers, which opened several sutures, fractured the malar bone, zygomatic arch, maxillæ, and mandible.

Nos. 6, 7, 8, 9, 10, and 11, I think can be answered by referring back to the body of my paper.

I desire to thank Dr. Brown for his interesting discussion and kindly appreciation and can only repeat my regret at not meeting him in Chicago.

Discussion on Dr. Cryer's Paper.

Milton T. Watson, Detroit.

The majority of us, I think, are ready to accept Dr. Cryer's opening statements regarding the improved breathing capacity, the effect upon the accessory sinuses and upon the general health which, *under certain circumstances,* follows the widening of the dental arches. His explanation of how and why these changes follow differs somewhat from that of a majority of writers, and yet when we take into consideration his wonderful experience in the anatomical field we are bound to ponder carefully what he says and to wonder if his explanation, with some features of it emphasized and slightly modified, is not after all the true one. The modification that seems to me necessary is this: the improved breathing capacity which Dr. Cryer attributes to the freeing of the tongue is merely the first step, and would not in itself and of itself be wholly responsible for the marked improvement that eventually takes place in the breathing capacity. I am quite ready to believe that it is really the beginning, and I am also very confident, in my own mind, that a very marked and rapid development of the bony structure of the internal face follows orthodontic treatment, especially with very young patients. That this secondary stage, just mentioned, may be due largely to the renewal of developmental activity which naturally follows the restoration of function and not to the stimulation produced by moving the teeth, is quite possible. There is, at any rate, a change beyond that due merely to the improved tone of the soft tissues.

If the improvement in the breathing capacity were due wholly to the change in the relation of the tongue to the oropharynx, then we would naturally have a right to expect this change to follow, after widening the dental arches, regardless of the age of the patient, and experience has proven all too often that such is not always the case.

Dr. Cryer states that a well-marked constriction of the dental arch may be found associated with a very well-developed width of the floor of the nose. That this condition does sometimes exist is true beyond any question, but my own observation would lead me to believe that such a condition only exists once where marked maldevelopment throughout the bony structures of the internal face is in evidence many times. It is a matter of common observation among orthodontists that cases do exist in which the character and degree of the dental deformity seems to be in evidence throughout the entire face, both externally and internally, so far as one is able to see, and that this whole condition changes to a marked degree following orthodontic interference on young patients, all of which would seem to indicate that we exert a very positive stimulating influence on bony structures quite remote from those actually operated upon when we correct a malocclusion of the teeth.

In view of the apparent evil influence upon so many of the bones of the face which Dr. Lawrence Baker has been able to demonstrate in his experiments in grinding the teeth to prevent occlusal contact, it seems not strange at all, but quite logical and natural, that the profound stimulating influence produced by moving the teeth should also influence beneficially these same structures, and the number of observers who record such results must not be passed over without due and careful consideration.

I should like very much to have Dr. Cryer explain a little more fully just what he means by the statement that "It is a question whether the narrow dental arch is in itself pathological or whether it is a morbid anatomical condition produced by an early pathological process."

Opening the Median Suture.

I am in hearty accord with the sentiments expressed by Dr. Cryer regarding the uncertainty as to whether or not the true maxillary suture is opened as often as some writers would have us believe. I have never seen but one case where I believed such a result obtained, and it was not accomplished by pressure against the teeth alone, but by a vulcanite plate completely covering and accurately fitting the crowns of the molars and bicuspids as well as the entire roof of the mouth; this was then cut lengthwise through the center with a heavy spring adjusted high upon the arch of the palate so that the pressure was directed against the palatal process to even a greater degree than it was against the teeth. This case was under the care of an inexperienced man, and the opening of the suture, if it really did occur, as I believe, was purely accidental.

The cases that I have seen where it was claimed that the suture had been opened were I believe, merely cases where the arch had been rapidly widened and where the separation of the inter-premaxillary suture, together with misleading radiographs, led to a false interpretation of what had actually occurred. Dr. G. V. I. Brown showed pictures of a green skull before the American Laryngological, Rhinological and Otological Society some three or four years ago, in which he had succeeded in opening the suture by pressure against the teeth and used it to prove that the suture could be opened, but in my discussion of that paper I took the position that it was the logical thing to expect in working on a green skull, but that it had little or no bearing on what would occur in the living subject. I have seen no reason yet to recede from that position, though I should like to know what Dr. Cryer thinks about it.

Just at this point I should like to emphasize the need for making it clear to rhinologists and physicians generally—though it is irrelevant so far as the discussion of this paper is concerned—that the widening of the upper arch alone, except in rare cases, is an impractical operation. You men, of course, know that proper occlusal relations must be established with the lower arch or the operation will end disastrously, but this is not clear to many physicians, as I happen to know, on account of having been severely criticized several times for refusing to attempt to open the inter-maxillary suture without at the same time widening the lower dental arch.

This subject is intensely interesting to me and I should like to pursue it much further, but I feel that I have already taken enough of your time.

Dr. H. A. Pullen, Buffalo.

In rising to discuss this excellent paper of Dr. Cryer's, I wish to congratulate him on the solving of some of our most difficult problems in treatment by pointing out the only sure guide and knowledge, at least macroscopically, of the hard and soft tissues which are associated structurally with the field of the orthodontist.

To those of us who are unfortunate enough not to be able to spend the time in original research work on skulls of human beings and animals, such papers as those presented at this meeting by both Drs. Dewey and Cryer are of inestimable value. From time to time Dr. Cryer has most generously allowed me, and others, the use of slides of these anatomical specimens for teaching purposes for which I am especially grateful.

It is extremely pleasing to know that the most eminent head anatomist of the world can heartily endorse orthodontic treatment as a beneficial procedure toward producing normal structural relations, hence normal physiological relations both in the internal face and indirectly through increased respiration and improved digestion, the entire human economy.

Dr. Cryer has shown by the exhibition of specimens that an undeveloped arch does not always mean an undeveloped nasal cavity and vice versa, but I do not think he would wish to detract by the exception, from the generally accepted hypothesis that the expansion of the dental arches increases or stimulates development of the nasal cavities through the extension of mechanical stresses upward and outward in arch expansion.

If the growth of these structures is independent one of the other, our hypothesis that expanding dental arches develops the superimposed structures of the nose falls somewhat flat.

It is a new point to many that the contracted or undeveloped dental arch causes the tongue to drop backward and close the air passage in the naso-pharyngeal region, thus causing most of the air to be inspired through the mouth, and then through a wrong stress of the muscles on their bony attachments to change the relationship of the bones themselves.

In interpreting the vicious cycle of the mouth, nose and pharynx, it is a little difficult to mark, then, the particular region in this cycle which first exhibited the pathological change in function and started the cycle, for the same reason that it is difficult to lay one's finger on a particular spoke of a revolving wheel.

When this vicious cycle is complete, the symptoms of faulty structure and function are evident all around this cycle and only a complete history of the normal and then of the abnormal development in the region of the mouth, nose, and pharynx can give us the clues to the particular pathological or abnormal feature which started these interdependent pathological conditions.

I have seen tonsils as large as walnuts which I believed interfered with the air passage of the naso-pharynx, causing mouth breathing. mesial occlusion of the teeth, wrong stress of muscles, diminution in stature, earache and muffled tone to voice, etc.

Again, I have been certain that adenoid tissue, becoming enlarged and blocking the naso-pharynx, or by blocking the lymph supply, or in some other way, started this same vicious cycle.

Finally, if contracted or undeveloped dental arches by forcing the tongue to take a backward position started this vicious cycle. we have yet to determine in these cases what caused the undeveloped arches. unless it be lack of nutrition, lack of function, or faulty structure through rickets or some other disease.

I have repeatedly stated that just in so far as we can determine the relation of the etiologic factor to the faulty development in these cases. can we properly diagnose and treat malocclusion.

I do not believe that it has been proven that some peculiar interference with the pituitary bodies which control harmonious development has not more of a bearing on the subject of development of the internal face than we are prone to credit it with.

Beyond all of the local causes for these faulty developments of the internal face there may still be a more remote cause of such faulty developments as are exhibited in the leptoproscopic skulls, with long, narrow faces, thin and high nose, small orbital cavities and accessory sinuses. small nasal chambers, a high-arched palate and undeveloped dental arches.

Many of these cases as pointed out by Dr. Hartz, of Detroit, we are tempted to say were produced by nasal stenosis and mouth breathing, the fact being, however, that many of them never had nasal obstruction, although from their appearance it would be the natural inference. "Such patients are very prone to nasal stoppage by inflammation and the smallest portion of the pharyngeal tonsil may produce complete occlusion."

Opening the Median Suture.

In a recent article I have commented on the operation of "opening the suture," so called, and have felt that I was on safe ground in saying that the operation is not advisable in all cases, that is, presuming that the suture can be opened, but only in those cases in which the diagnosis of extremely bad nasal conditions would warrant an operation that promised more immediate relief from deficient respiratory function by rapidly widening the nasal space and increasing the function of respiration.

In all of the cases in which it has been claimed that the suture has been opened, the claim has been made that the respiratory function was increased after treatment, and this evidence is significant if we can trust the veracity of the investigators, for it would tend to prove that the attempted suture opening was beneficial, whether it opened the suture or spread the palatal plates.

From a macroscopical examination of Dr. Dewey's specimens, the evidence of the suture not being opened is positive, although this is only the first experiment and only one dog was operated on.

One factor seemed to be established, however (if we can trust the evidence of the tightening of the teeth in the dog whose arch was expanded as indicative of bone development being caused by the mechanical stress), and that is, that the rational treatment of malocclusion has not yet proven to be other than the slow, gradual stimulation of the bone, causing the greatest development of the dental arches, according to Nature's physiological plan, to which method the majority of orthodontists are inclined.

If the suture is not opened in the operations described by Drs. Barnes and Hawley and others, then it remains for our anatomists and original researchers to show us in further histological studies what does happen along the median suture and in other areas of the palate through attempted mechanical separation of the halves of the maxilla.

Dr. C. A. Hawley, Washington, D. C.

It is needless to say, it is with greatest gratification that I view the work that has been presented at this meeting on the subject of opening the suture. These three papers are of great value. As Dr. Pullen has just said, "there is more to be considered in this subject than merely the question whether or not the suture is opened." It was said earlier in the meeting that, at the present time, the burden of proof is on those who believe that the suture is not opened. That is wrong. At the present time, there is no evidence, so far as we can see, that is reliable that the suture is opened, and the burden of proof is upon those who offer that explanation of an unusual occurrence.

The defect I see in Dr. Dewey's work, although I acknowledge its great value, is that he did not produce a typical operation. There has been an operation that has attracted attention for the last fifty years that is different from the ordinary tooth movement. That phenomenon has been called the opening of the suture, and I wish to call attention here again to the fact that no bad results have ever been reported from it. Some excellent men have reported this operation in our journals, and there are many others who have reported unpublished cases where this phenomenon occurred, yet so far as I know not a single man has reported any bad results. I think that is significant, and worth considering.

In the condition Dr. Cryer has described, if his explanation is true that the contraction of the dental vault has the effect of pushing the tongue back in the mouth, is not the operation that we have been considering the best operation that could possibly be done, because it would relieve that condition in a very short time? It seems to me now, after all the evidence that is produced on this subject in regard to opening the suture, there is still left the consideration of the value of the operation. In what I have observed in my own work, I have no question of its value, and I fail to see a single sign of a bad result, and, it seems to me, that when bad conditions can be improved in so short a time it is something that is worth considering, and I would like to see more attention paid to that phase of the subject. I would like to have Dr. Cryer discuss it.

Dr. Dewey hinted it was possible that development was along the region on each side of the suture, as I proposed last year as an hypothesis. To me it appears to be the region of movement, and his experiments, while he did not produce a typical operation, show rapid development in that region. If that is true, it will be of great value to know it, because it will make a difference in the adjustment of appliances. It will make a difference in the mechanics of this method of moving teeth. If the development can be produced in that region, then we can produce it slowly or rapidly as we please. It has been the supposition, so far as I know, of those who believe they open the suture that it must be done rapidly.

Two weeks ago Dr. Brown was in Baltimore, and I had the opportunity of talking with him for a long time on the subject, and so far as I could gather, his belief is that the operation should be rapid if you would open the suture. There seems to be a sentiment that we will settle this whole question if it is proven that the suture is not opened; yet, it seems to me, there are a number of things hinging around this operation that will need serious consideration.

Dr. William J. Brady, Kansas City. In view of certain experiences I have had in connection with suture opening operations, I believe I should present them while we are on the subject. I have twice had occasion to use appliances where a jack-screw was placed across the roof of the mouth and used in the good old-fashioned way of twisting up as tight as possible, and in each case there must have been opening of the suture. There was every outside indication of it, a condition existing such as Dr. Ottolengui has described where there was separation between the front teeth, a slightly hollow place extending from front to back along the median suture, the soft tissues tightly stretched and slightly painful at this place. In one case in addition to this the two maxillæ were so loose they could be moved about. I am sure there must have been a genuine suture opening in that case, extending from the front clear back past the first molars.

A Member. That was no suture opening; that was a fracture case and you didn't recognize it. (Laughter.)

Dr. Brady. Well, whatever it was I don't know, for I was too scared to make any examination. I had no thought of pursuing any advantage I might have gained, but only to keep from being found out, in what I had done. (Laughter.) There were no X-rays to use then and I was too excited to think of making an examination by incision or probe. But as Dr. Hawley pointed out, no bad results followed. My patients, who were about eleven or twelve years old, complained of a little soreness; the one with the "fracture" complained more of the looseness of the two halves of the upper jaw than anything else. In each case I hastily took off the regulating appliances on some pretext or other, and kind Providence came to my rescue. Nothing at all happened. The two halves of the jaws settled back to place, the soreness disappeared, and as I was too afraid to do anything more I dismissed each of the patients, saying they were either too old or too young to have any regulating done—I don't remember which—and no trouble came of the occurrence so far as I know.

I want to report another case of a patient of nineteen or twenty years in which Dr. G. V. I. Brown opened the suture rapidly for the purpose of increasing the nasal space, and where I made the appliance under Dr. Brown's direction. This method has been advocated in articles by Dr. Brown, and has been referred to at this meeting.

In both the other cases mentioned the ordinary jack-screw was used, resting against bars along the lingual side of the teeth, and after about ten to fourteen days the presumed opening occurred. In Dr. Brown's case practically the same appliance was used, except that the lingual bars and the jack-screw were much heavier. The jack-screw was located near the first bicuspids. It was so arranged that the patient could tighten it, and he was given instructions to keep it screwed up to the limit. In about ten or eleven days there was a condition similar to that of my greenhorn days; there was a decided separation between the central incisors, the soft tissues were hollowed out along the line of the median suture back to the molar region, and there seemed to be considerable improvement in the young man's breathing capacity. I believe the suture was opened and the bony tissues actually pulled apart, and I remember that no trouble resulted in the bony structures from the operation.

But I do not believe this is a good operation. In the case described the occlusion of the teeth was completely disarranged. In commenting on this particular point, to which I called Dr. Brown's attention, he dismissed it by saying that a little matter like that did not amount to anything, which goes to show that Dr. Brown does not appreciate the importance of occlusion, and that he did not realize he had ruined the occlusion in his case.

While Dr. Brown is an eminent oral surgeon and I am personally friendly to him, yet I must disagree with him as to the value of his operation for forcibly opening the suture, for followed as he advocates it, the occlusion of the teeth is sacrificed to gain a little wider nasal opening. Pursued along more conservative lines there might be good in it, but this whole procedure of suture opening seems very radical to me. In view of all that has been presented by Dr. Dewey, Dr. Barnes, Dr. Cryer, and everybody else who has reported, I am in about the same condition of mind as Dr. Ottolengui—I do not know whether I believe anything or not—and I should not wonder if there are several others in the same boat.

Dr. C. A. Hawley. Dr. Brady has introduced into the discussion the question of occlusion of the teeth, but I do not think any man in this society would undertake suture opening without restoring the occlusion of the teeth. Occlusion is not the question, but rather what really occurs when we operate, and *do* we open the suture? Dr. Federspiel suggested a way of opening in and finding out what happens. Dr. Brown has evidently paid no attention to the occlusion of the teeth. We will not presume that if this operation should be adopted, that any man here would undertake it without restoring the occlusion of the teeth by properly operating on the lower jaw also. That phase of the subject does not come up for consideration.

Dr. Varney E. Barnes, Cleveland.

I wish to relate an experience I had in the case of a boy, seventeen years of age. I put on pressure as described, rapidly opening the space or suture, whichever you want to call it, and a depression appeared in the roof of the mouth, changing the boy from a mouth breather to a nose breather, and since that time there has been rapid spreading of the lower arch, and there is good occlusion of the lower teeth.

Dr. Cryer has shown some illustrations where the nasal cavity is wider in proportion to the dental arch, some wide, some narrow. I think we may explain that in this way: teeth come into the arch too narrow; the posterior teeth have not come forward as they should; the second molar coming forward forces the arch forward; the third molar forces it still more forward, and those teeth, instead of coming into the arch properly, the whole thing comes forward or tries to, and meeting with resistance and pressure of the teeth that are coming in widens the arch in that way. If the patient has no nasal obstruction, I am satisfied the tongue and nasal breathing help to increase the width of the arch. In certain cases before anything was done I took casts of the cases when seven years of age, and then got them at sixteen. The posterior part of the arch widened and the anterior part had not.

Dr. Frank M. Casto, Cleveland.

There is just one point relative to the development of the nares to which I desire to call attention. The lower maxillary portion of the nasal space is developed to a larger extent after birth than is the upper two-thirds. The nasal space is divided into the upper and lower portions, the maxillary portion being right over that part of the nose, so that the nasal space is developed to a greater extent afterwards than it is up to that time. If the child has nasal stenosis, breathes through the mouth, if there is pressure of the arch on the palate plus pressure of the muscles on the lateral side of the dental arches, the development of the maxillary portion is retarded to a great extent. It may be almost entirely retarded in some cases, so that the maxilla does not develop downward, the palate preventing that. The vomer continues to develop, and that is one explanation for the buckling of that bone, it cannot come down to its proper strata in the bones of the face.

Dr. M. H. Cryer. (Closing.) I am very much gratified by your kind reception of my paper and am glad to know that you are thinking about the subject.

Your president, Dr. Watson, asked what I meant by the pathological condition of the narrow dental arches. It was said in the paper, "There is a question whether the narrow dental arch is in itself pathological or whether it is a morbid anatomical condition, produced by an early pathological process." I had hoped that someone would discuss this point, for I am not fully satisfied with it myself. Shall we classify the narrow arch as morbid anatomy, or shall it be considered as the result of some pathological disturbance, either in early embryonic life or produced by some hereditary influence?

Illustration No. 30 shows that the narrowing of this entire face was due to a cause that must have existed about or before the time of development of the maxillary sinuses, this specimen has no maxillary sinus on one side and only a rudimentary one on the other.

As to correcting the deformities we find in and about the mouth, pharynx and nasal cavities, if the dental arches be contracted, then let us spread them to their normal position.

Dr. Barnes spoke about affording quick relief. I know of nothing that will give quicker relief to a congested nasal chamber than removing the obstruction in and about the naso-pharynx.

Dr. M. N. Federspiel. Do you not find cases of cleft palate in those who are mouth breathers?

Dr. M. H. Cryer. Cleft palates as a rule are not necessarily associated with mouth breathers, though, of course, a person having a cleft palate usually breathes through the mouth to a great extent. I would like to refer to two illustrations Nos. 1 and 4 in answer to a question about the anterior teeth and their alveolar processes becoming so yielding. In illustration No. 1 it will be seen that the four incisor teeth are in the two premaxillæ; between these bones is the inter-premaxillary suture, having no interlacing fibers. Between the laterals and canine teeth, on each side there is a suture with very slight bonds of union of interlacing fibers crossing it in early life. Illustration No. 4 also shows this lack of the bonds of union between the premaxillary bones, the sutures between the canine teeth and the lateral are covered over but slightly by interlacing fibers which in some cases act as strap hinges from one bone to the other. Now, if pressure be applied between the incisors, the inter-premaxillary suture will open and allow the separation of teeth and the premaxillary bones.

The Development of the Maxillæ with Reference to Opening the Median Suture.

By Martin Dewey, Kansas City, Mo.

In giving this lecture, the greatest trouble which I have had is in limiting myself to those phases of the question which have a direct bearing on the subject. There are so many things that enter into the question of the development of the maxillæ with reference to the opening of the suture that I was forced to sort my slides even after I reached Chicago, so as to be able to limit my talk to the time allotted.

Some of the members yesterday insisted upon discussing my paper before it was read, for which I was truly thankful, as I now know I was right in considering some of the men's opinions which I took into consideration while doing this work.

If you will review the dental literature on the subject of "opening the median suture" with reference to increasing the width of the dental arch and increasing the nasal space, you will find a great many different opinions advocated as to the value of that line of treatment. A great many men have described cases in which they claim that the clinical results which they have obtained could be explained only by the opening of the suture between the premaxillæ and maxillæ. I do not know who was first to advocate this plan of treatment, but it has been advocated quite often in the last ten years; and all have claimed great advantages for this method over the gradual expansion of the dental arch. The papers which have recently been published under the authorship of Dr. Pullen, of Buffalo, and Dr. Hawley, of Washington, may be taken as papers which have reviewed the questions of the opening of the suture quite thoroughly, and you would suppose from reading their papers that they were in favor of the operation. On the other side we have the statements from Dr. Cryer, of Philadelphia, and Dr. Federspeil, of Milwaukee, who do not think the opening of the median suture possible. Again, we have the opinion of men like my friend Dr. Brady, of Kansas City, who thinks he has opened the median suture in two cases, and who nevertheless condemns the operation as one that is unscientific and not conducive to the best results.

Evidence in Favor of Opening Median Suture.

With these different views in mind, I would say that all of the evidence that I have seen presented in favor of opening the median suture has been of a clinical character. I am aware that papers have been presented before this society at various times advocating the opening of the suture; ingenious appliances have been proposed and described; models have been shown of the cases before and after treatment, along with radiographs intended to prove that the suture had been opened. The benefits to the patients have been described and many advantages outlined for that plan of treatment, but as Dr. Brady has said: "No evidence has been given that would cause us to believe that better results, or results as good, could not have been obtained by a different plan of treatment, one which would have produced a gradual expansion of the arches." Clinical evidence is the principal evidence that we have in favor of the opening of the suture, and I am one who believes that there is no class of evidence that is so faulty or open to so many grave errors. Men who have reported the cases of "opening of the suture" have always been in favor of the operation; they have only seen certain things happen and have not looked for any other explanation of the results presenting, while there might have been a more logical explanation of the results as shown by the models and radiographs. As an example of the faulty views that may be adopted by taking into consideration only clinical evidence, I have only to refer you back a few years, when the entire medical profession thought tuberculosis an inherited disease. Did we not see one person after another in the same family contract the disease? Did we not see children of mothers who were tuberculous develop the disease? Generation after generation were doomed to die because, as the world thought at that time, the disease, being inherited, there was no hope for the offspring. At a later date I refer you to syphilis. Congenital syphilis was one of the diseases that had a firm hold in the minds of those who based their knowledge on clinical evidence, and it was but recently that scientific investigation proved the disease to be the result of a germ. I simply mention this to show you the weakness of clinical evidence when unsupported by other facts.

The Author's Opinion.

My opinion in regard to the opening of the intermaxillary, premaxillary, median suture, or whatever you may call it, is probably between the two extremes. I am not ready to say that the median suture or the sutures between the two halves of the maxillæ cannot be opened; neither do I believe that it is the proper thing to do. In beginning my work upon this subject I was inclined to ask myself the following questions: What evidence have you that you can or cannot open the median suture? If you can open it, what would you gain and what harm might you produce? Would there be any danger in spreading the halves of the maxillæ, which would amount to practically spreading the halves of the face? What is to become of the bones and cartilages which form the septum of the nose? What will the vomer do? Will it project down in space between the halves of the maxillæ, as has been suggested by some? Also, what will happen to the connective tissue which lies between or binds the two halves of the maxillæ together?

After you have taken these things into consideration you should enlighten yourself by a study of the anatomy of the parts, and should make your studies not only on the dry specimens, but also upon fresh specimens. Some of the conditions which have been shown as representing the opening of the median suture have been found in skulls in which no attempt has ever been made to open the suture. These conditions have been found both in radiographs and in anatomical examinations.

I think some men have made the statement that the suture is a known region of bone development. Dr. Jackson, in a paper read before the National Dental Association at Denver, laid great stress upon the growth of bone from the region of the suture, which would lead you to think that probably the greatest amount of bone was developed in the immediate neighborhood of the suture. What evidence have we that bone develops any more rapidly in the suture than it does anywhere else?

Some have advocated that an increase of the breathing space could be obtained by opening the median suture, thereby increasing the width of the nose. I cannot see that any great benefit could result in the breathing of the patient, for the greatest width and the increase of space would be obtained in the inferior meatus, which meatus is not necessary to the proper breathing of man.

There are some of the lower animals in which the skull always presents an open median suture, and we do not find a wide nasal space, but one that is comparatively narrower than in those animals in which the median suture is closed. Therefore, if those animals which have an open suture possess narrow nasal cavities and narrow dental arches, we cannot draw any conclusions from that phase of comparative dental anatomy that would suggest that an open suture would be of any benefit to man. (Figs. 1 and 2.)

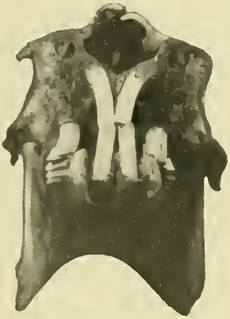


Fig. 1. Showing narrow dental arch and wide breaking space. Open suture and narrow dental arch.—Rabbit.

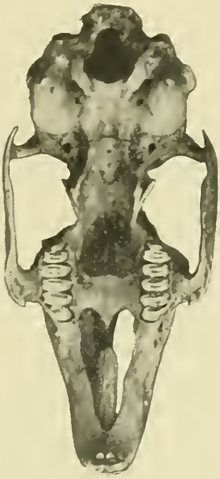


Fig. 2. Showing open median suture between the maxillæ and distal portion of the premaxillæ.—Rabbit—occlusal view.

In studying this question, you should take into consideration the evolution and development of the parts; note the different jaw forms which we find in the lower animals, also the relation of the jaws to the open or closed condition of the suture and the development of the parts as associated with the suture. In studying the development of the jaws we should notice the development of the suture and the bones in the median line. Take into consideration the development of the bones of the face as well as the development of the oral cavity. You must consider that at one time the oral cavity occupied the whole of the lower part of the face, and that the nose is only the second story to the mouth. Also the development of the premaxillary bones must be considered, and the origin of the same as compared to the rest of the upper tooth-bearing bones. The intimate relation which exists between the nasal and oral cavity compels us to admit that anything that causes very much change in the oral cavity will produce some change in the nasal cavity.

The Vomer.

You must bear in mind the evolution of the vomer; the relation of the vomer to the rest of the bones of the mouth and nasal cavity. The vomer was originally a tooth-bearing bone which projected down between the maxillæ and palate (see Fig. 2). It develops from a downward growth from the frontonasal process, and is not formed from the first branchial arch, as is the maxillæ. In man the vomer occupied a space in the nasal cavity, but is supported by a rostum of bone which develops for that purpose (Fig. 6). If you open the median suture you must of necessity do something to the vomer which is attached to the maxillæ in the region of the suture. What do you do?

Would Opening Suture be Advantageous?

Another phase of the question is, What are you going to gain by the opening of the suture? I have mentioned the fact that in the lower animals an open suture does not necessarily mean a wide nasal cavity nor a wide dental arch. I have also stated that the inferior meatus is not necessary to the breathing of man, for you can pack the inferior meatus full of cotton and the normal individual will breath as well as ever. Also I might state that a great many physicians think if the inferior meatus is open the child should breathe through the nose; so they state that there is nothing the matter with the child because they fail to find obstruction in the lower meatus. Therefore, the increased space in the nasal cavity that you would get would not be in position that would do you much good.

Why is the advocated opening of the median suture more of an advantage than the gradual expansion of the dental arch, which will cause a development of the nasal cavity and give us the breathing space where we need it, which has been proven time and time again to be true? Yet we have men like Drs. Hawley and Barnes tell us that they obtain results by the so-called opening of the suture that they could not obtain any other way. We must accept their statement as at least expressing their opinions, and they should be heard. However, it is possible that they have failed to open the suture, but by the application of force in attempting one thing have produced another which is equally good.

Bone Development.

I called your attention to the statement of some men that the suture was a known region of bone development. So far as I know, no evidence has been presented that would tend to prove that bone develops with any greater rapidity in the region of the suture than elsewhere. I mean that the increased width of the dental arch from the child to the adult is not the result of the increase of bone that forms in the region of the suture, but is the formation of subperiosteal bone over the whole of the maxillæ and nasal bones. In order to settle this question, or at least throw some light on it, we will have to take up the embryonic development of bone and also the development of bone in the adult, and notice the difference between the endocartilage development, intramembranous and subperiosteal bone. All bone grows by subperiosteal development except

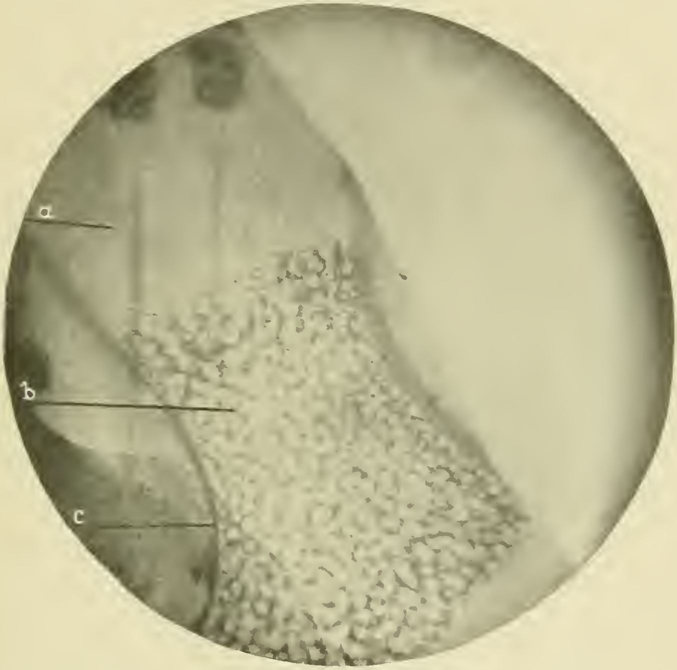


Fig. 3. Section of endochondral bone development from base of skull. (*a*) Cartilage cells arranged in rows. (*b*) Calcified cartilage matrix not true bone. (*c*) Periosteum formed from perichondrium which will form subperiosteal bone.

those that have been provided with an epiphyseal cartilage. Also the epiphyseal cartilage provides only for an increase in the length of the bone, while the diameter of the bone is increased by the subperiosteal growth. So then the development of the bones of the face is one of subperiosteal growth, as there is no epiphyseal cartilage between the halves of the maxillæ.

In order to determine if the bone develops under natural conditions any more rapidly in the region of the suture than elsewhere, I have made a number of studies in human and comparative embryos and in adult skulls. I have found nothing that would lead me to believe that there is any greater growth in the region of the suture than there is anywhere else in the region of the periosteum. In order to thoroughly understand the different appearances of bone, I call your attention to a number of microphotographs which show different kinds of bone development and the region from which they have been taken.

The final solution of the question of the possible advantages to be derived from the opening of the median suture seems to me to depend upon the question of bone development. If by opening the median suture we get a development of bone which we cannot get in any other way, then by all means the operation is one that should be done. In order to justify the operation, or rather the plan of treatment, it has been suggested by men who favor that plan of treatment that the bone develops more rapidly in the region of the suture than anywhere else. Now, in order to understand the development of bone I will have to take you through the different phases of bone development. Therefore I will review first briefly the development of endochondral bone, or that bone which is primarily laid down in cartilage.

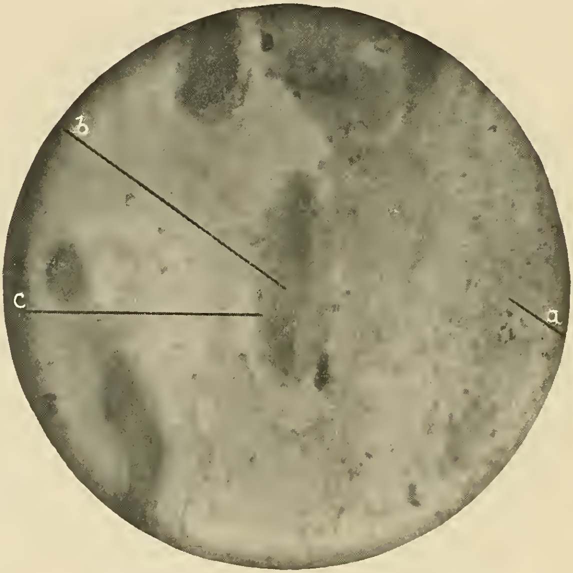


Fig. 4. (*a*) Embryonic osteoblasts forming an area of bone development. (*b*) Island of intramembranous bone. (*c*) Osteoblasts around island of bone.

Endochondral Bone.

It is very probable that endochondral bone development is the primary bone development from the standpoint of evolution, because, if you remember, there are cartilaginous fishes in which the skeleton never reaches the "bony" state, but remains as cartilage. There are a number of the bones in the skeleton of man that are first laid down in cartilage and then later formed into bone by the endochondral process. Briefly, the first phase to the formation of bone is the development of cartilage from the mesoderm, very much in the nature of hyaline cartilage. Then the cartilage cells undergo a rapid change, the nucleoli seem to degenerate and arrange themselves in rows and the intercellular substance becomes calcified (Fig. 3). This gives us a calcified cartilage matrix upon which the bone proper is formed. The next step is an inward growth of a blood vessel from the perichondrium, which carries with it a number of embryonic cells which are divided into two classes; some of them have the power to absorb the calcified cartilage matrix and are therefore called the osteoclasts, and others build bone and are called osteoblasts. Osteoclasts absorb a part of the calcified cartilage matrix, and upon the remaining calcified cartilage matrix is deposited the true bone by the osteoblasts, which form the primary Haversian systems. The space between the primary Haversian systems is filled by the calcified cartilage matrix, or, more correctly, the first Haversian systems were

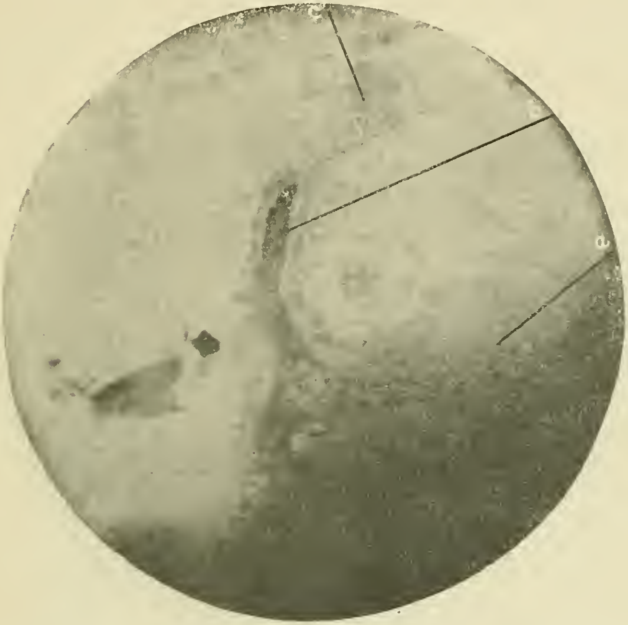


Fig. 5. Area on the buccal side of maxillæ. (*a*) Mass of osteoblasts showing that bone development is proceeding outward. (*b*) Spiculæ of intramembranous bone projecting buccally. (*c*) Osteoblasts collected so as to continue formation of bone outward.

formed upon this cartilage which was calcified. On the outside of this bone we have the perichondrium changed to the periosteum, and as soon as the formation of bone begins on the cartilage matrix the increase in diameter of the original cartilage matrix is provided for by the formation of bone by the periosteum, which bone is known as subperiosteal bone. The changes which take place in the cartilage during the process of the calcification of the cartilage, the appearance of the newly formed Haversian systems, with the calcified cartilage matrix between the Haversian systems, make a picture which one can easily recognize in any field under the microscope. This picture is so noticeable and so characteristic that if you once see it you will never mistake it for any other form of bone development. Neither will you mistake any other bone development for endochondral bone development.

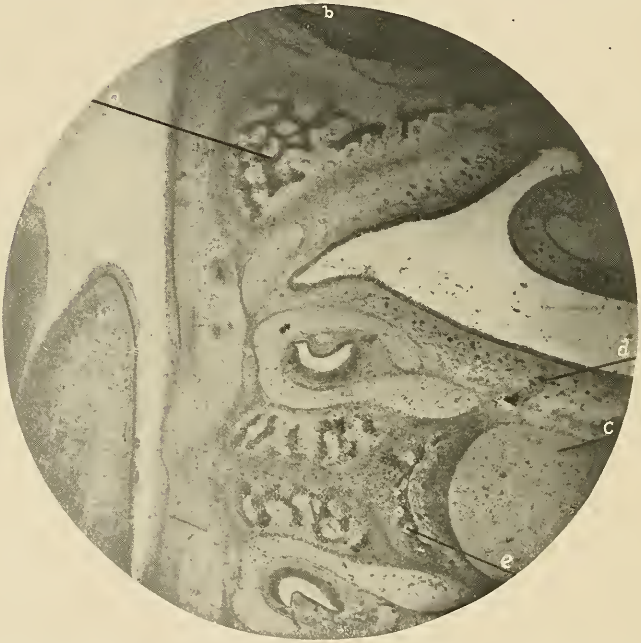


Fig. 6. Section through pig embryo showing formation of maxillæ and vomer. (*a*) Intramembranous bone formation on lingual side of tooth. (*b*) Tooth germ. (*c*) Cartilaginous vomer which does not calcify. (*d*) Mesodermic tissue in which intramembranous bone formation is taking place, forming one-half of vomer. (*e*) Intramembranous bone developed from premaxillary bud to support vomer. There is no evidence of endochondral bone formation in the cartilage of the vomer.

Now if we had a cartilage, something like the epiphyseal cartilage, between the two halves of the maxillæ in the region of the suture, we might expect to get bone development, or a continued bone development in that region, but we have no cartilage in this location; neither do we find any place in the maxillæ that shows that the development of the maxillæ takes place by the endochondral process, so that leaves us without any hope of getting from the plan of opening the suture a growth of bone in the region of the suture such as we have in the location of the epiphyseal cartilages.

Intramembranous Bone Development.

The next form of bone development that must be considered is the intramembranous form, which to me is a much simpler process. Intramembranous bone formation, as the name implies, is that process where the bone is laid down directly within the connective tissue, that is, in the embryonic connective tissue, or, more correctly, within the mesodermic tissue. We have the maxillæ formed from the maxillary bud of the first branchial arch, and the maxillary portion of the first branchial arch develops wholly as a connective-tissue bud. In the mandible we have Meckel's cartilage, but no part of Meckel's cartilage is ever formed into bone within the region of the mandible. The first thing we notice in the formation of intramembranous bone is a collection of cells (Fig. 4, a), which are large and round, and which can be very easily recognized from the surrounding cells in the immediate field.

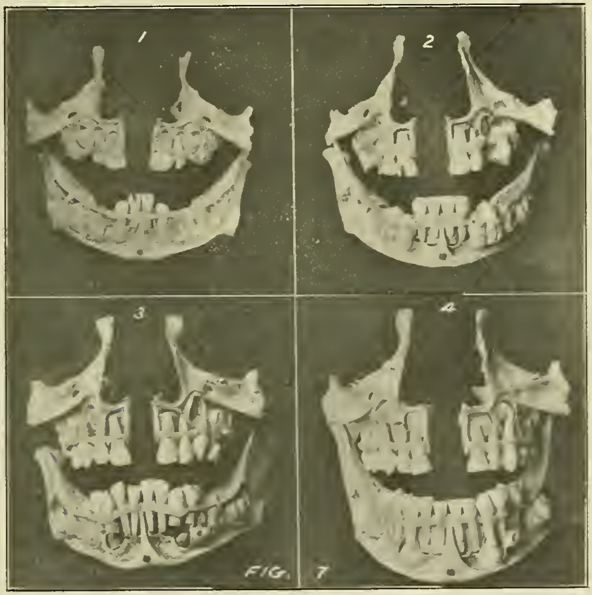


Fig. 7. (1) About nine months. (2) About one year. (3) About two years. (4) About four years.

The next thing will be the formation of an island of bone (Fig. 4, b), which has been formed by those round cells which are osteoblasts. This island of bone proceeds to increase in size probably in one direction more than it does in the other. However, some area of ossification or islands of bone will seem to increase in one direction and the approximating one

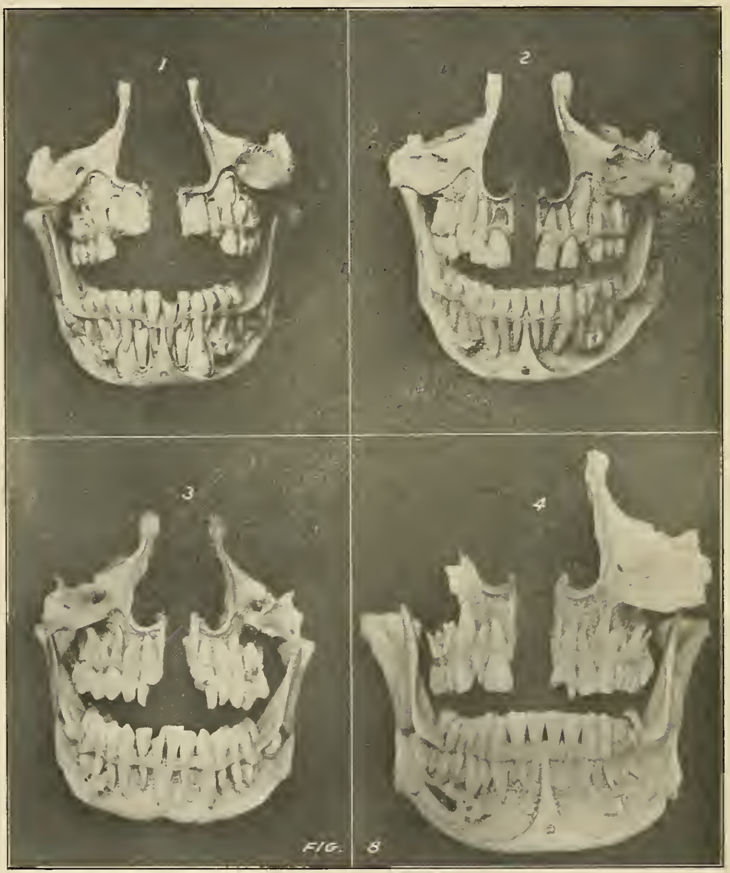


Fig. 8. (1) The seventh year. (2) The eleventh year. (3) The fourteenth year. (4) Adult.

will increase in some other direction, making a number of these bony processes, which may be spoken of as centers of ossification. In the formation of these spiculæ of bone (Fig. 5) they present an appearance very much like the formation of ice spiculæ when water begins to freeze in a bucket. These spiculæ of bone continue to multiply and increase in size until eventually they unite with one another, leaving primary marrow spaces between them, which, of course, are filled up with a substance very similar to the marrow found in the marrow cavity of long bones. These spaces between the bone spiculæ are filled with the remains of the embryonic tissue out of which the bone was formed, and, of course, contains a great number of osteoblasts and osteoclasts. It is always possible for those cells to begin activity and develop bone anywhere within that particular region. Wherever you have embryonic cells that are capable of developing into osteoblasts or osteoclasts, bone development may take place, either by the building of new bone or by the absorption of bone already built and the laying down of other spiculæ. All that is necessary is to provide the proper stimulation. After you have an area of ossification proceeding to a certain size you will notice the formation of a connective tissue on the surface of the bone, which is the periosteum. The rapid growth of bone which causes the increase in size of the bones of the face is the result of the activity of the osteoblasts within the osteogenetic layer of the periosteum. But you must not forget that there are osteoblasts all through the bone, within the marrow spaces of the bone, which under proper stimulation will develop bone, and also osteoclasts which under proper stimulation will cause the absorption of bone; so you have throughout the entire body of intramembranous bone and on the outside of it osteoblasts which are able to develop bone, and there is no need for us to look to the suture as the "known region of bone development," or to hope that our salvation in the expansion of arches lies in the opening of the suture to produce bone growth in that particular region.

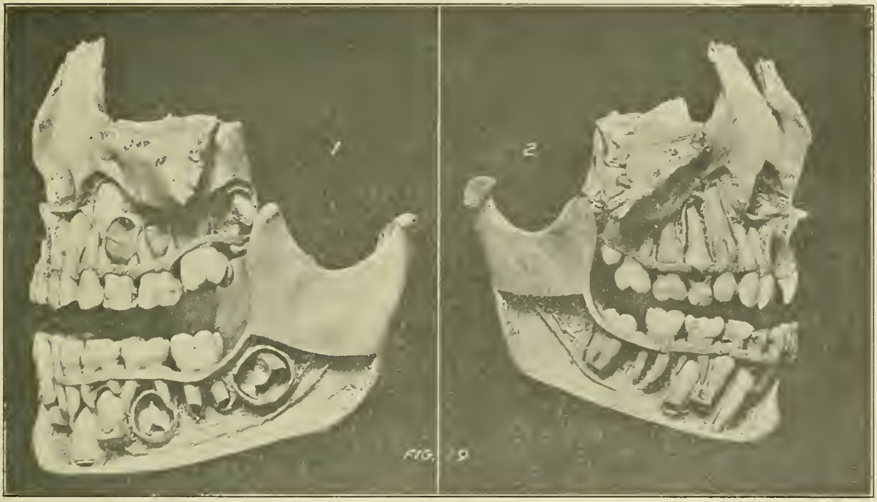


Fig. 9. Side view of skulls showing the relation of the developing teeth to the growth of the bone. (1) The seventh year. (2) The tenth year.

The development of the jaws and face can be understood only by taking into consideration the intramembranous formation of bone. The microphotographs which I have shown you give the gradual development of the spiculæ of bone, then the increase in size of the areas of ossification by the addition of bone on the outside of the bone already formed; and we see that the osteoblasts always collect upon the side of the bone toward which there is the greatest growth. If you will consider the change of facial outline from a child to that of an adult (Figs. 7, 8 and 9, from Dr. F. B. Noyes' collection) you will see that the only possible way in which the maxillæ could be formed would be by subperiosteal development. There is no possible development that could take place in the region of the suture that would change the face of a child to that of an adult. Take the mandible of a child and that of an adult; there is no way in which the growth could be brought about except by the development of bone on the labial sides and the absorption of bone on the lingual side.

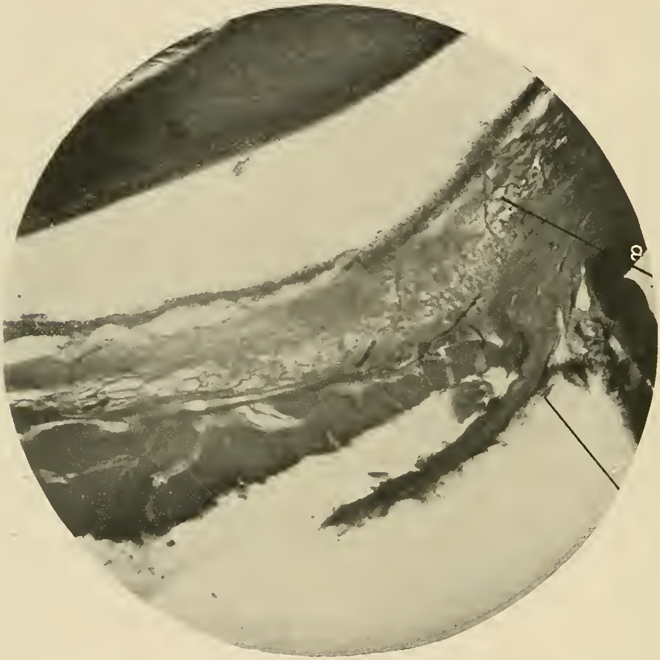


Fig. 10. (*a*) Embryonic tissue from which the peridental membrane will be found. (*b*) Bone found by subperidental development.

In a section made from the developing alveolar process around a deciduous molar, we find that the bone is developing on the labial side of the labial plate, and on the lingual side of the labial plate the osteoclasts of the peridental membrane are producing an absorption. As the tooth is erupting it is being carried outward by the growth of the bone, which is also producing a greater width of the maxillæ and nasal space (Fig. 10). You will find the bone more dense on the side toward which the greater activity of bone development is occurring, while on the lingual side you find the bone absorbed to such an extent that there are large medullary spaces. Also canals are seen running through the bone, which canals carry blood vessels and embryonic cells. It is by the subperiosteal development of bone that the maxillæ and mandible increase in size and change shape. There is no possible way by which the face of a child of nine months could be developed into that of an adult by the development of bone in the region of the suture. The entire change from a child to an adult is the result of bone development as I have described it, and this development is produced by the stimulating influences which nature brings to bear. If nature does not supply the proper stimulating influences, then that stimulation can be supplied by a properly adjusted regulating appliance.

The Median Suture Always Existent.

I made a series of sections through the median sutures of a number of adult skulls. These skulls were taken from the dissecting room and the exact age is not known. It is very difficult to decalcify sections taken from this region sufficiently to enable one to cut a specimen thin enough to make a good microphotograph. The median suture does not close as early in life as most men suppose it does, judging by the writings upon the subject. In fact, from my investigations, I do not believe that it ever becomes obliterated. By that I mean that there is never an osseous attachment of the right premaxilla with the left. The bone never fills up the suture to such an extent as to obliterate the suture. The bone may develop to such an extent as to obliterate the suture from the naked eye, but an examination of the specimen with the microscope will reveal a thin layer of connective tissue between the two premaxillæ. This connective tissue between the maxillæ and the premaxillæ is white inelastic tissue, which binds the bones together. The fibres of this tissue pass across from the right to the left and are built into the bone in such a manner as to bind the bone together. I have never been able to distinguish any cells which I would say were osteoblasts. I am aware that in the young subject we would find a number of osteoblasts in the connective tissue between the maxillæ, right and left, and between the right and left premaxillæ. You do not find any evidence of an osteogenetic layer of the periosteum within the connective tissue between the maxillæ, as you find in the periosteum covering the bone elsewhere. There is nothing within the connective tissue between the bone, that is in the connective tissue in the suture which would suggest a greater rapidity of bone development than we find elsewhere. In fact we would expect, from the appearance of the bone and periosteum, that there would be a greater activity of bone formation on the oral and nasal side of the suture than there would be within the suture itself. The right and left maxillæ or the right and left premaxillæ never unite by an osseous union, for some connective tissue always remains between the right and left bone. The bones may approach each other so closely that there will be an interlocking or "dove-tail" effect which will unite them mechanically, but tissue always remains between the two. There is no cartilage between the right and left bone, such as you find in the epiphysis of the long bones; if there were, we might expect to get an increased bone development in that region by opening the suture. However, as the suture is filled with connective tissue, the principal function of which is to hold the bones together, I can see no reason for expecting a greater development of bone by tearing the connective tissue loose from the bone than you would get by a gradual expansion of the dental arches. If you will remember that the teeth have been responsible for the development of the bone which supports them, and that the nose has been developed from what was part of the oral cavity, you see why the force applied upon the teeth will cause a development of bone in parts far removed from the teeth.

Experiments on Lower Jaws of Dogs.

In order that we might study the actual changes that occur in the attempt to open the suture, I began experimenting upon dogs. I am aware that the dentition of a dog and man are decidedly different; however, there is no animal except the man-like apes that closely approach man. At the present time I have not been able to secure apes for my work. There is very little trouble to secure dogs from the city streets, but the age of a dog is always a question of doubt; yet a dog that lives upon the street will not escape the dog-catcher very many trips in succession. The dogs which I secured for these experiments were not over two years old.

In the dogs we have a condition which is both objectionable and advantageous to our use. The two halves of the mandible of the dog never become entirely ossified; the connective tissue such as we find in the suture of the premaxillæ and maxillæ of man binds the two halves of the mandible together. In preparing an anatomical specimen the two halves of the mandible always separate. If it were possible and so easy to open a suture, as we are led to believe it to be by those who advocate the opening of the suture, we would expect that by placing appliances upon the lower canines, and by exerting stress upon those teeth, in short time we would open the suture between the two halves of the mandible. In fact, it seemed to me to be so easy that I really felt sorry for the dog, as I thought that some morning I would go to the animal room and find the dog with a divided mandible, in which case I would chloroform one dog and try and hold the mandibles of the others until the bone filled in and they united. However, the actual results were very different. I placed bands upon the lower canines and attached tubes to the bands in such a manner as to produce a bodily movement of the canines. After working on these cases eighty-five days I found that the teeth had moved in an almost upright position, but that there was absolutely no evidence of an open suture. When the animals were killed I found that the sutures in those which had been operated upon were more closed than the sutures in those which had not been operated upon. This proved that the force which had been exerted upon the teeth had caused a development of bone around the fibres of the connective tissue with a view of holding the bone together, and not with a view of increasing the distance between the two halves of the mandible, as is claimed in the operation upon children. There was a great amount of bone development around the canines, for you must remember that each canine was moved more than an eighth of an inch and still was not moved out of the alveolar process, as some of the older writers told us would occur if we expanded the teeth too much in the lower arch. Bone developed on the lingual side of the canine to such an extent that the teeth that had been moved were tighter than those that had not been moved. There is no doubt but that the regulating appliance will develop bone, or "build bone," if you want to use the term that has been used by some. However, this developing of bone, or "building of bone," is not the final solution to the retention of teeth, for unless the forces of occlusion are exactly the same as those exerted by the retaining appliances the bone will be again absorbed and the tooth moved to its old position. However, as I am carrying on another set of experiments with this point in view, I will have more to say in regard to this phase at a later meeting. Bone developed not only around the teeth that had the appliances on them, but also around the teeth that were far removed; also, bone developed in the maxillæ as far back as the first molar, which in the dog averages about three inches from the canines.

Experiments on Upper Jaws of Dogs.

In attempting to open the median suture in the maxillæ, the canines again afford excellent anchorage. The advantage again is in favor of opening the suture, because the animals have a longer distance from the zygomatic arch, which would permit the suture to spread in the anterior region with more ease than it would in the child. The appliances were placed upon the teeth in such a manner as to produce a bodily movement of the teeth. Bands were placed on the canines with tubes parallel with the long axis of the tooth. Arches were used which were made from the regular arch as made and sold by Dr. Brady. More stress was placed upon these teeth than will ever be placed upon the teeth of a child. The appliance produced no inconvenience and the animals suffered no pain whatever. They always were glad to eat any kind of food given them, but for the protection of the regulating appliances, bones were not included as a regular article of diet. They all got fat during the treatment. Upon killing the dogs and comparing them with six which had not been operated upon, some of the results obtained were very surprising. During the experiment of eighty-five days' duration there was nothing observed that would suggest that we were opening the suture, and when the specimen was prepared we found not only that the suture was not open, but that it was more closed than in the dogs that had not been operated on. Again, bone had developed in the neighborhood of the connective fibres which make up the tissue found in the region of the suture in such a manner as to bind the bone together, but not to increase the width of the parts. The appearance of the maxillæ shows that there had been an increase of bone through the entire maxillæ wherever there was marrow within the medullary spaces. The shape of the maxillæ has changed, which is conclusive proof that the widening of the dental arch will change the roof of the mouth or the palatal arch, which fact has been disputed by some men. The bone developed around the upper canines the same as it did around the lower, on both the lingual and labial sides of the tooth, the labial plate of bone developing as rapidly as the tooth was moved and was as thick over the moved teeth as it was over those that had not been moved. Again, as in the lower, the bone on the lingual side of the tooth developed as rapidly as the tooth was moved outward, disproving the theory that after you move a tooth there is always a space left behind the tooth which has to be filled up with new bone during the period of retention. The teeth in these dogs were moved more rapidly than teeth would ever be moved in a child, still we find the bone developed tightly against the teeth. I believe that in a great many of our cases, in fact, in all of them, the bone develops much more rapidly than we think it does, and that the solution of retention is not in getting a growth of bone around the teeth while we are retaining them or moving them, but in establishing the normal forces of occlusion, and until we do get the six normal forces of occlusion the teeth will not be maintained in a fixed position. Bone developed around the teeth upon which no pressure had been placed. In the dogs which had not had teeth regulated all of the teeth dropped out when the skull was being cleaned, but in the ones upon which we had operated all of the teeth were tight and did not drop out when the skull was cleaned, which proves that there had been a development of bone even in localities far removed from the regulating appliance. It has been observed in clinical cases that when moving one tooth, the ones adjoining will follow it, which is not entirely the result of springing the alveolus or bone, but it is also the result of cell growth.

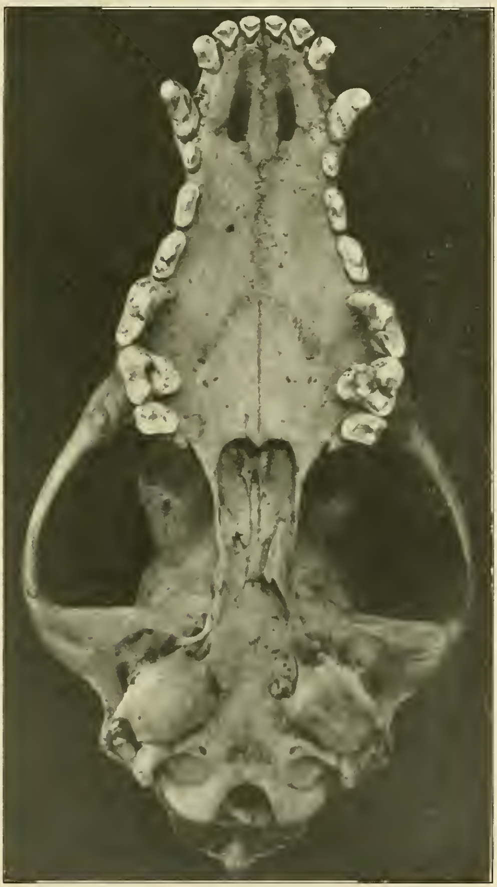


Fig. 11.

In the dogs which did not have regulating appliances on the teeth we found a noticeable ridge of bone projecting lingually, while in the operated specimens we find that the ridge had been absorbed, which is further proof that the palate changes as a result of stress upon the teeth. You must remember that the tissue covering the roof of the mouth is what has been called muco-periosteum, or attached periosteum, which is composed of the mucous membrane of the mouth and the tissue of the periosteum in that neighborhood. In the attached periosteum the fibres are attached to the bone, and the large number of them make a covering

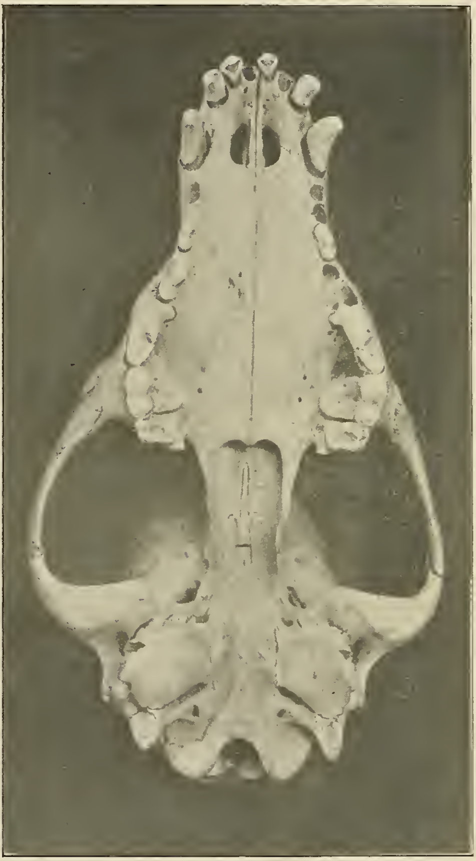


Fig. 12.

which is decidedly inelastic. They are also communicative with the fibres of the peridental membrane, which is also inelastic. Bone will change more rapidly than these fibres will change. Therefore, when stress is placed upon the teeth and transmitted through the peridental membrane to the fibres all over the roof of the mouth, we find the changes taking place that were observed in the dogs and are seen in patients.

Next year I hope to be able to give you the results of a greater number of experiments, along with the microscopical findings in cases in which the teeth have been moved.

Conclusions.

First, the opening of the suture is a more difficult proposition than we had supposed. Second, the evidence in favor of the opening of the suture that has been presented is not sufficiently positive to prove that the suture has ever been opened in any case. Third, there is no histological evidence to lead us to believe that the bone develops any more rapidly within the region of the suture than anywhere else. Fourth, the development of the face from the child to that of an adult could not be brought about by the addition of bone to the suture. Fifth, subperiosteal bone development is the form that is responsible for the changes such as occur in the development of the face and the movement of the teeth. Sixth, there is no cartilage in the region of the suture which would cause a development similar to that which is found in the epiphyseal centres.

Therefore, let me say that, as a result of my experiments and anatomical studies, I am convinced that the stress which is placed upon the teeth in trying to open the suture only causes a development of bone through the entire maxillæ and nasal spaces, which accounts for the improvement in the individual as described by Drs. Barnes and Hawley.

Fig. 11 is from a photograph of the skull of a dog which had appliances upon the teeth; Fig. 12 from one which did not have the teeth regulated. The development of bone around the teeth and changed appearance of the suture can be noted.

Discussion of Dr. Dewey's Paper.

Dr. M. N. Federspiel, Milwaukee. Dr. Dewey's lecture on the development of the maxillæ and nasal cavity with reference to expanding the arch and opening the suture is deserving of the highest praise. I am sorry that Dr. Dewey did not furnish me with a manuscript so that I could follow him and carry on the discussion in detail.

I agree with Dr. Dewey, and I have believed for years back, that it is an impossibility to open the maxillary suture. I am not so well versed in embryology as I would wish, although I took some interest in it when at school, but if embryology is the foundation of medical science, you cannot be successful in any line in medicine unless you have a thorough knowledge of embryology and anatomy.

I wish to take issue with Dr. Dewey regarding one matter, and that is clinical evidence. I cannot for the life of me understand why so many men are afraid to make an exploratory incision. Suppose each man in this audience took five clinical cases and made a radical expansion of the arch, then injected a local anesthetic and made an exploratory incision. What better evidence do you want? The surgeon frequently makes exploratory incisions which tell the story. I have done it about six times under novocain anesthesia, retracted the flaps, and found no opening of the suture. I cannot understand what better evidence you want.

You may say, I only report six cases. True. I cannot do it in all of my cases, but I do think that if, say, fifty men could each take two cases, and then have a report of one hundred cases, the evidence would be sufficient to settle the question now and forever as to whether we can or

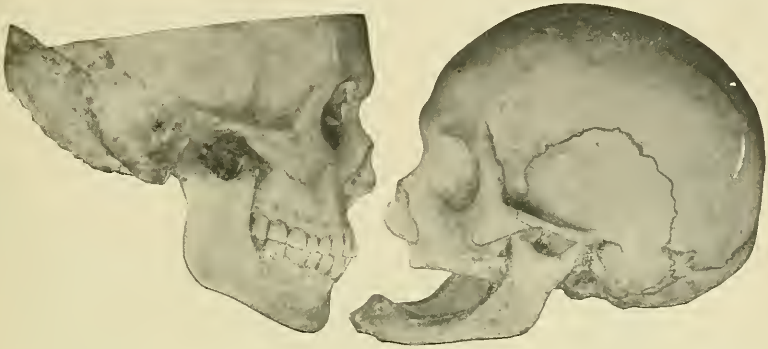


Fig. 1.

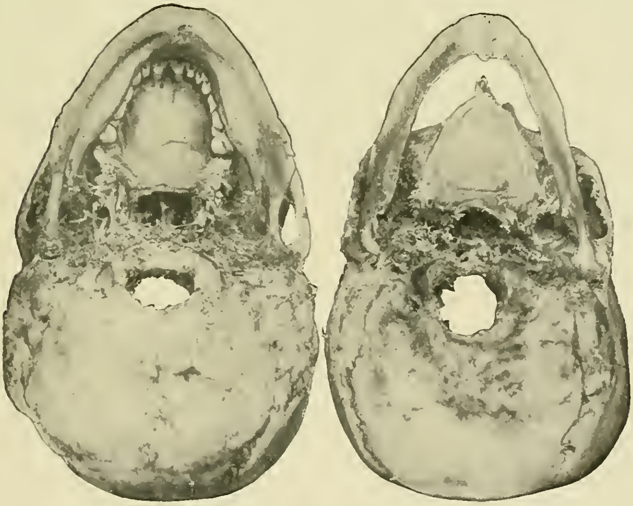


Fig. 2.

cannot open the maxillary suture. Further than that, I do not care to enter into a discussion of Dr. Dewey's paper.

I would like to ask Dr. Dewey a question, namely, What do you mean by the change that takes place in the palatal fold? Is there a change in the position of it, or is there an embryological change in the tissue itself?

Dr. M. H. Cryer, Philadelphia.

It is not necessary to discuss Dr. Dewey's lecture, but I wish to say this, that I have come all the way from Philadelphia to this meeting for a certain object, and feel doubly repaid for my journey by listening to Dr. Dewey's remarks, and having this opportunity to see some of the results of his splendid research work. I only wish he were not so far away, that I could see more of his investigations. (Applause.)

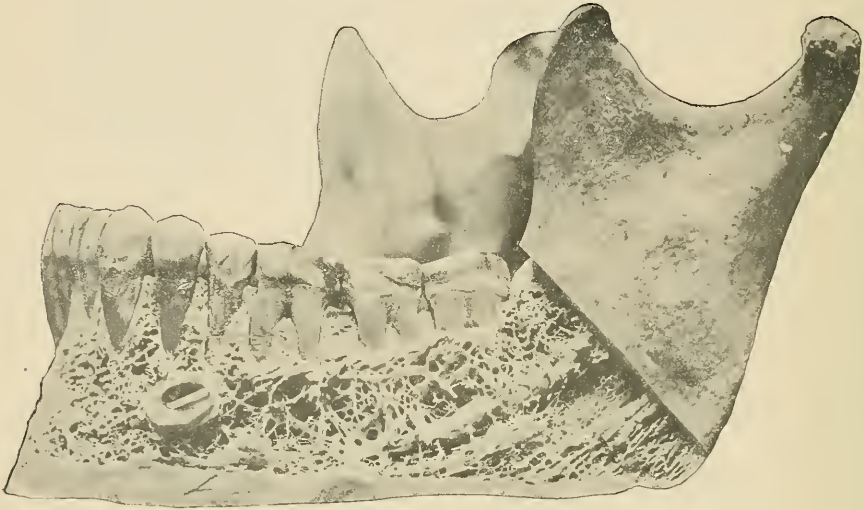


Fig. 3.

I should like to have a few slides thrown on the screen, not for the purpose of criticizing anything Dr. Dewey has said, but in support of some of his statements.

Fig. 1. He spoke of the young skull with the teeth in position, and said that when the alveolar process of the teeth develops, everything is built on the outside. In this slide we have two pictures; the left is from a skull of a person about twenty-five years of age while the other is from a skull of over seventy-five years. I show these to illustrate the building up on the outside of the alveolar process with the teeth which belong to it. When these teeth are lost, this built-out portion is also lost, and we almost come again to the original size of the child's jaw, or the roof of the mouth as shown in the aged skull.

Fig. 2 gives an under view of the same skulls. The younger one shows that the process of the upper jaw has been built out, not depending on the opening of any suture. In the aged skull is shown the extent the upper jaw is reduced by the loss of the teeth and alveolar process. It will be noticed in both slides that the lower jaw develops in a different manner. The body of the lower jaw increases in size by interstitial growth, and the alveolar process is built on this structure; consequently, when the teeth and alveolar process are lost the lower jaw retains its circumference to a great extent.

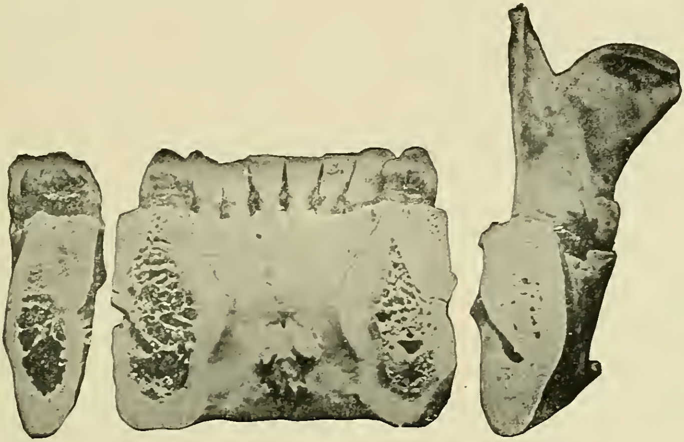


Fig. 4.

Dr. Dewey spoke of the growth of bone by irritation. To some extent I agree with him, but in many cases I would prefer to think the increase in size was due to hypertrophy or deposit of bone rather than growth.

Fig. 3 shows the cortical portion of the mandible removed, exposing the beautiful arrangement of the cancellated tissue of the internal structure of the jaw. There has been no irritation, consequently there has been no increase in size or deposit within this structure. If the curvatures of this internal structure be observed, it will indicate to you how each tooth has been carried forward to make room for the erupting posterior teeth.

In Fig. 4 we come to Dr. Dewey's point as to irritation causing growth of bone. In the left side of this specimen, the normally open cancellated tissue shows the condition that permits the orthodontist to correct irregularities. but on the right side he would be unable to change the position of the teeth, because the osteoblasts have deposited bone within the cancellated tissue, making it unyielding and dense. In this particular case the pathological condition was produced from irritation caused by a diseased first molar.

Dr. William J. Brady, Kansas City, Mo.

I think we are to be congratulated on having so excellent a paper from Dr. Dewey, and I think Dr. Dewey is to be congratulated in having this audience. This recalls certain circumstances that occurred in this city a number of years ago. Dr. Dewey had read a paper before the American Society of Orthodontists; it was not as deep as the one presented to-day, but still, deeper than the ordinary run of papers, and hardly a word was said in discussion. Dr. Dewey felt rather discouraged that his paper had not been discussed, when I said, "Young man, they paid you the greatest compliment they could in not discussing it—they acknowledged it was deep, deeper than they could wade in." Now to-day he has a paper far beyond that one and we have had a most excellent discussion following it, one in which we feel we understand something about the subject, which shows that this society has grown, as well as Dr. Dewey. We know that when Dr. Dewey talks we will always hear something good, but I think he has shown himself exceptionally brilliant in this case, and has given us a great many facts which we were just ready to have set before us, out of which we certainly have got much good.

There is one feature of this paper and its discussion in relation to our friend, Dr. Barnes, that I wish to touch upon. It must not be thought that because there is a great deal of talk against opening the suture that we are trying to discourage or discredit Dr. Barnes. He is working on the same problem as the rest of us, which resolves itself into the question "how do the bones of the face normally develop, and how do we get the development we are all working for in orthodontic treatment?" He has contributed his mite of light on the subject, and all these other things are merely contributions toward solving the same problem, not arguments directed against Dr. Barnes and his findings. We are trying to get at the facts and come to some reliable conclusions, and while the opinions of Dr. Barnes and others differ, it must not be taken that there is real antagonism between Dr. Barnes and Dr. Dewey or the other speakers. I am sure Dr. Barnes is charitable enough to take it in this light.

In another year from now, if the Board of Censors is kind enough to ask me to take part in the program, I hope to contribute another chapter to this subject. While we have been discussing the matter for several years, yet there is much more to consider before we shall have reached the end.

Dr. J. Lowe Young, New York City.

I want to ask Dr. Dewey one question. I do not know whether I misunderstood him or not. If I understood him correctly, I want to take issue with him. In speaking of the slide that had the two upper arches, one a deciduous and one a permanent arch, after examining them he said he did not see any use in developing the deciduous arch in order to make room for the permanent teeth. Is that correct?

Dr. Dewey. I believe I said there is no use in making the deciduous arch wider than the permanent arch.

Dr. Young. Am I to understand that you do not see any sense in making it wider by opening the suture, or making it wider in any way? Which it it?

Dr. Dewey. Why should you throw the deciduous teeth out to occupy the same width that the permanent arch is going to have, when with the eruption of the permanent teeth the arch will develop?

Dr. Young. If that is your position, Doctor, I will take issue with you in this way: the full complement of deciduous teeth are in full eruption at three years of age, or before, and almost inevitably the incisors are in contact with each other at this age. Dr. Barnes has shown by slides that this condition does not prevail at five years of age where normal development has taken place. I have a beautiful specimen in my office which shows that at five years of age there are pronounced spaces between the deciduous incisors, and also between the incisors and cuspids. This is the normal position for these teeth where normal development has taken place. The majority of children will show absence of such spaces between the deciduous teeth, at five years of age. Why? I should say for the same reason the essayist has said, namely, it is due to a lack of use or a lack of stimulation that the bone has not developed. If the child were chewing spruce gum all day long and tough beefsteak, rubber bands, and so on, we should have far more development and far more space between the deciduous teeth. Dr. Ferris has advised that the child should take so many bites on a rope of rubber after each meal, and it is a good thing if done conscientiously and systematically. If Nature does not bring about this development up to five or six years of age, I will say up to the time the first permanent molar starts to erupt, the orthodontist who does not start in with the treatment of such a case at that time is derelict in his duty. This is the ideal time to treat every case of malocclusion. If I were building a house and found a mistake in the foundation, I would not wait until the house were built to correct it. The permanent incisors are wider than the deciduous ones and unless spaces develop between the deciduous incisors as specified above, malocclusion will be the inevitable result when the permanent incisors begin to erupt. Where such under-developed cases are properly treated at an early age, and sufficient room created to accommodate the permanent incisors before they begin to erupt, it has been noted that while these teeth may start to erupt in a rotated position, that the constant tongue pressure will cause them to assume their proper position during the eruptive period. I have yet to find a man who could tell me how long to hold lower incisors that have been in full eruption in a rotated position, so that they will not rotate back when the retention is removed. I do know that lower incisors which have been rotated as they erupted will remain in the normal position after three months' retention.

Dr. R. Ottolengui, New York.

I would like to begin my discussion where Dr. Young left off. If I understand Dr. Dewey, his argument is that if the deciduous arches are in normal occlusion, there is no good reason why the orthodontist should undertake to enlarge them to the size of adult jaws at an age so early that there is a possibility that Nature will work out the development. With this I am entirely in accord. On the other hand, Dr. Young, Dr. Barnes and others argue that where we find an absence of spaces between the anterior teeth at a time when normal development should have caused such spacing, it would be well for the orthodontist to artificially enlarge the arches to make room for the second set. With this I am also in accord. But I cannot lay down any binding rules, such as those which Dr. Young has attributed to Dr. Barnes, and say that at the age of three the temporary teeth may be all in contact, whereas at the age of five the interproximal spaces should appear.

I wish we might stop talking about patients who are "three years old," "four years old," "five years old," etc., etc. Some men make it a rule to write the age of the patient on their record models. To me the age is a matter of only secondary importance. I endeavor to study my cases, not by the age of the patient, but by the period of eruption which presents. For example, when we find the sixth year molars just erupting, we should understand what the normal conditions of the temporary arches should be at that period. With the appearance of the incisors, we have another period of development, etc., etc. If we are familiar with the normal conditions which should prevail at these various stages of tooth eruption, we could easily diagnose a lack of development and the nature of interference needed, but I know of no one who can positively state what a child's arch should be at a specified age. For example, I have a girl in my care who is thirteen years of age, and who has fully erupted her entire denture including the third molars; but I have another girl who is seventeen years old, in whose mouth the first upper bicuspids are just breaking through, while the four second temporary molars are still in place, as are also the upper temporary cuspids.

There is no doubt in my mind that if we could have had casts of the first girl at the age of five, we would have noted the spacing between the temporary teeth, said to be due at that age; but I am equally certain that no such spacing would have been found in the mouth of the second child, even at the age of seven. But where an individual develops as slowly as this last girl, who can say at the age of five that her jaws would not develop merely because there were no spaces between her teeth? or to put it in another way, How can anyone say by examining the mouth of a child five years old, before the appearance of any second teeth, whether the time for the spacing of the teeth has arrived yet or not? Personally, I think it quite safe in the majority of cases to await the appearance of the sixth-year molars before making any orthodontic interference. Of course, there would be exceptions to this rule—extreme distal occlusion or evidences of Class III conditions being among the exceptions.

I would like to say just a word about opening the suture. As you all know, at the St. Louis meeting, I read a paper describing a split plate, made of vulcanite rubber and carrying a wooden wedge, which I had long been using for rapidly extending the upper arches. There was no doubt then, and there is no doubt now, that with this appliance the teeth may be moved buccally *en masse,* and for this reason I was under the impression at that time that this lateral expansion was produced by an opening of the suture. But the criticisms which I met at that meeting were such that I must confess I have never used the plate since. I was somewhat surprised recently to learn that whereas my experience in St. Louis caused me to abandon the plate, my St. Louis paper had induced Dr. Jos. D. Eby, of Atlanta, Ga., to adopt this method, and not only that, but he has been calling it the "Ottolengui Suture Opener." I wrote him a letter, questioning the propriety of using such a name for the plate and expressing a doubt as to whether the suture is really ever opened. I would like to quote from a letter from him in which he gives some rather interesting views as to what actually occurs when the upper arch is spread with this appliance. Dr. Eby writes as follows:

"If you will consider the stresses as applied by Ottolengui Suture Openers, it must be remembered that only a normal stimulus is applied so that the osteoclasts may perform their normal functions of bone destruction in the vicinity of the applied force, which, in turn, stimulates the osteoblasts in their functional behavior of reconstructing new tissue in turn.

"Now, by the means of this normal stimulance so perfectly applied in the Ottolengui Suture Opener, it has been my observation, as shown by the wonderful improvements in breathing as well as by actual measurements, that the dome of the arch is not only broadened laterally, but the floor of the nose is lowered also.

"Therefore, under this slow reconstructive change, there need be no material necessity for the suture to actually be separated in order to secure the desired results.

"This question of suture opening which has come before the orthodontic world so universally, is one which is of very deep interest to me, because it involves all of the fundamental principles in the reconstructive tissues and is based upon the principles on which we all should strive, founding our work as nearly as possible on a return to normal."

I should say that Dr. Eby is a teacher in the Atlanta Dental College, and that he has had a great deal of experience in the use of this appliance in the infirmary in that college. Let me add here that it will require a lot of evidence to convince me that the nasal floor can be lowered.

Dr. Varney E. Barnes, Cleveland.

It seems to me that the explanation given by Dr. Ottolengui, as brought out by Dr. Eby, is rational—in fact, the most rational supposition that has been put before us, and it seemed from the X-rays I showed yesterday, in which I took one X-ray one month and the other one the next month, that space is filled up, so that this apparent opening, which seems to be an unfortunate term and is misunderstood, is really or possibly a means of disposition of bone between the margins of the suture, or the margins of the suture completely fill it.

I have been interested in Dr. Dewey's illustrations, and it strikes me that he is in the same predicament that Darwin was; he has not found the missing link. When we draw a parallel between lower animals and human beings we must have that question of doubt which is scientific—always think of everything with a doubt. We may believe in a thing for the time being, but question it nevertheless. Everything presented in Dr. Dewey's paper is with a doubt. We are simply studying this question.

Of the two specimens which Dr. Dewey handed around there is one in which the teeth are loose. This is a control specimen without any orthodontic interference or pressure interference. The other specimen shows, shall we say, ankylosis of the cuspid teeth, and also rigidity of the attachment to the other teeth in which no attachment was made, and in which there was no interference so far as I can determine. This raises a serious question. If the application of power in the manner described causes ankylosis of the teeth interfered with, or interference with the dental arches after they have formed, it is a pretty serious problem. The alternative is preventive orthodontia under physiological pressure.

Before I leave the subject, however, I want to say that after regulating a certain case years ago with the horizontal hinge, and not being satisfied with the result, I called the case in again and did the work over. I treated the upper and lower arches in the same manner, tried it for a year, and could not accomplish what I desired, and the girl laughed at me. We used ligatures. Evidently in that case there was ankylosis. This lower arch was deficient in its spreading. It is reasonable to assume we are going to have impacted eruption from an abnormal condition; that the patient is apt to suffer more or less reflexly, not necessarily pain. His contention that bone develops from mechanical stimulation is entirely correct. There is no question about that. The suture may still be opened under that stimulation. I say opened. We must loosen the attachments to the bone still deposited in there under the stimulus. The periosteum is still there and has the power to deposit bone. No one has claimed that bone deposits more rapidly in the suture than it does in other places, nor that development stops there. In these cases of deformity I would assume with reasonableness that there was defective development; that development should have gone on from that point and did not. I do not believe, nor do I claim, that the entire width or development of the jaw is completed at or near the suture. Development takes place peripherally. When the teeth are loose, the alveolar process is loose and the jaw grows smaller, or we see an apparent deciduous jaw. Now, then, I think when we put pressure on we should try to imitate what seems to be normal development. We have had presented to us the evidence of anatomists, histologists, and physiologists; evidence which is taken from the cadaver, and many of these slides were given to us as specimens of normal development, showing eruptions of the teeth, or the teeth ready to erupt, showing them in their crude condition, a condition of embryonic formation, but which condition should not continue much after three or four years of age. It is almost entirely lost from five to six years of age, which is the growth period approximately.

In the study of Italians, which is the best early developed race I have ever got hold of, I found some forty developments which in my critical examination I was pleased to call normal; that is to say, there were forty out of nine hundred and eighty. Thirty-five per cent. of the nine hundred and eighty were classed as normal developments by the general dentists in examining them. I could not so class them.

It has been claimed by Dr. Dewey that this interference in the small jaw, where the teeth are in normal occlusion, is not warranted; that the teeth will develop or simulate development. Some ninety-seven per cent.

of the people of our civilization, the Caucasians, have deformities of the jaws; twenty-five per cent. of these cases do not develop in response to this stimulus. The anatomists have given us specimens of patients who died because they could not live and grow. They were not normal. They have no evidence and no proof that these cases were normal. The best evidence we have to-day is that which we have gathered from clinical observation on living patients during development, which the histologists and anatomists have not yet paralleled. I think they can work along that line. These investigations ought to be continued, but they ought to parallel the investigations, considering the means we have of watching, in the human being. We must X-ray these animals as we do human beings. I will help all I can in this way, but we must not jump at conclusions, and Dr. Dewey is trying to draw deductions from a number of specimens which I think are wrong.

Dr. Martin Dewey. I feel very much pleased with the discussion, because it is the first time in my life I have ever agreed with Dr. Ottolengui. (Laughter.) He says you cannot take a child five or six years of age and say that individual will not have a normal arch at seven, because youngsters do not develop at the same age. Furthermore, Dr. Barnes admits that the deciduous arches do develop; that a space is formed between those deciduous teeth, and that when he finds no space forming he puts on his appliance. While I am in agreement with Dr. Ottolengui, I would like to ask Dr. Barnes: How does he know they will not develop at six years of age; how does he justify himself in expanding the deciduous arch to the width of the permanent teeth? These men try to do everything Nature should have done, and probably will do in the majority of cases. An appliance will at least assist if the incisors are rotated and there is not room enough for them; then there is some reason for expanding the arch, but there is no reason for expanding the arch in order to make room for the permanent cuspids to develop. I believe clinical observation is a poor thing to judge by.

Dr. Barnes makes the statement that possibly in that animal in which I put on an appliance I got ankylosis of those teeth. I did not get ankylosis of the teeth. There is no evidence that human teeth or teeth attached to the alveolar process become ankylosed. There is no evidence that cementum and bone ever unite. You have ankylosis of the teeth in fishes and in the lower animals. You do not have a peridental membrane. You have union or approximation of bone and growth of the bone and cementum which is limited to the amount of peridental membrane in the alveolus There may be locking or dovetailing of these two tissues, but not absolute union. If you put an appliance on to open the suture you do not open it, but you increase the development of bone in that region. That skull shows there is development of bone in that region, but the development of that bone has closed the suture and made it tighter. The bone as developed has that mechanical stimulation to strengthen that particular thing. The bone is developed all around the entire superior maxilla, because if it did not, how in the world would the teeth have gotten tighter? As a result of that growth, going back to Dr. Barnes' statement, the suture is in a region where it cannot develop. I do not know what he means by that. He says that in these cases, where there is a lack of development of the upper arch, it occurs because the bone stops growing in the neighborhood of the suture. I cannot agree with him at all that the upper arch fails to develop because the bone stops growing everywhere around the whole thing. If you try to expand the arch by physiological tooth movement you produce growth of bone all over the alveolar process and produce mighty little in the immediate neighborhood of the suture.

Dr. Barnes. I have not disagreed with you in regard to that.

Dr. Casto. Is there any difference, in your opinion, between bone formed by mechanical stimulation and that formed naturally without any interference?

Dr. Dewey. My opinion is not worth a cent, because I have nothing to prove it. I do not believe that there is any difference. The whole skeleton is developed as the result of mechanical stimulation, and if you get mechanical stimulation to correspond with physiological stimulation you get the same amount of bone.

Retaining Appliances.

By William J. Brady, Kansas City, Mo.

It must be admitted that the development of retaining appliances has not kept pace with that of regulating appliances. It is natural that the first efforts in orthodontia should have been directed toward the first part of the work—the moving of teeth—but we have now reached a place in orthodontia where attention should be given to the retention of teeth till that part of the work is brought up to the present high standard of regulating. Proper retention of teeth is even more important than their regulation, for while teeth *may* be moved by a very indifferent appliance, yet they *must* be retained well or failure will follow even the most perfect result in regulation. Without doubt the next great practical field in orthodontia needing cultivation is that of retaining appliances.

This paper is not intended to cover the general field of retention and retainers, but only to formulate certain principles on which correct retention of the teeth is founded, and to consider some particular features of construction in retainers. None of these things is new, but they have been recognized in a more or less definite way for some time, though it is believed they have never been set forth connectedly before.

Dr. Edward H. Angle has given us the first great principle underlying retention, which may be stated as follows: Each regulated tooth tends to return to its old position, and that tendency must be counteracted in some manner until the tooth becomes firm in its new position. Thus a tooth that has been moved labially tends to move lingually back to the old place, or if it has been elongated tends to sink back in its socket, or if it has been rotated tends to rotate back again. The simple counteracting of these tendencies has been the chief consideration in retention until recently, but orthodontia has now reached a development which demands the recognition of other principles in addition.

An Important Principle in Retention.

For instance, no orthodontist, however skillful or fortunate, can so regulate a case that all the teeth will be in absolutely the exact relationship required in normal occlusion; there will always remain certain small adjustments of the teeth to their neighbors and to their antagonists, which can come only by these teeth working themselves into a complete final occlusion. If this adjustment is not made before the removal of the retaining appliance it is bound to occur after its removal, as teeth will not stay in any certain position unless occlusion holds them there, no matter what the retainer nor how long it is worn. This explains why the teeth fail to "stay put" in many cases. And retention is not complete in any case till the teeth are finally so adjusted to one another that the mechanics of occlusion will hold them in the proper position when the retaining appliance is removed. Hence, as a second principle of retention, the teeth should be free to adjust themselves into all the details of a complete and correct occlusion while they are counteracted from returning to their old positions.

Of course, it is not always possible to get entirely free movement of all the teeth during retention, but it should be secured as nearly as can be, and by planning especially for it this can be obtained oftener than is usually done. In allowing this free movement, however, the mistake must not be made of insufficient retention, such as occurs with, say, only two bands to support a soft metal bar in place to supposedly retain an entire dental arch. This is just as undesirable as the other extreme of holding all the teeth entirely fixed.

There is another feature that must be considered in retention in the orthodontia of the present day. Not only must normal occlusion be gained, but normal conditions of all associated structures as well. The nasal opening must be widened and all obstructions removed that normal breathing may occur; the lining of the entire nasal and upper respiratory tract must be normal and not left hypertrophied nor with abnormal secretions; the lip function must often be restored; bad habits, such as lip-biting, etc., must be broken up; the relaxation of muscles during sleep (and thus promoting mouth-breathing long after the necessity for it has passed) must be counteracted and overcome; and actual development of bony tissue must be gained in many instances. All these things are really essential to retention, and to ignore them often means failure, fully as much as to neglect to hold the teeth properly. In fact, these side considerations are many times the most important features of real retention, therefore the necessity for establishing a third principle, as follows: All conditions contributory to producing malocclusion must be corrected as fully as the malocclusion itself.

Simplicity a Requisite.

There are other considerations in regard to retaining appliances, which, while they cannot be designated as principles, yet are features applicable to most cases. For instance, a retainer should not be difficult to construct. Retainers form a considerable part of an orthodontist's work, and he should not needlessly waste his time and energies on retainers of difficult pattern, when it has been abundantly proved that those of simple pattern will do the work and are preferable in every way. Practicability in construction should always be kept in mind in designing a retainer quite as much as any other feature, not only to save time and energy, but also because the chances are greater of getting a properly fitting appliance. As a first general feature, a retainer should be "makable."

As a second proposition, a retainer should be so constructed that it can be easily and quickly applied after it is made. Certain retainers have been proposed that are much like the steamboat the man built in his cellar—mighty hard to get where wanted after being made. Retainers should be so made that there is some assurance of success in cementing all bands in application. There must not be many bands to be applied at once, or some will surely fail of proper cementation. When bands are needed on the molars or bicuspids, clamp bands should be used rather than plain bands, and these bands should be detachable, thus allowing the appliance to be put on in sections. This not only gives a chance for proper cementation, but makes it possible to apply a closer fitting appliance than when fixed anterior and posterior bands must be simultaneously applied to teeth whose crowns stand in widely diverging directions.

The comfort of the patient is no small item in putting on a retainer. Regulated teeth are always somewhat tender, and the application of a retainer may easily become a trying ordeal; in fact, many times the pattern of the retainer makes it decidedly painful. By use of a retainer put on in sections, the least pain possible is caused as well as the most perfect cementation. So we repeat the second rule, that a retaining appliance should be "put-onable" as well as makable.

As a third proposition, a retainer should be "take-offable" after being applied. This does not mean that it should be removable at the will of the patient, but capable of removal by the dentist without wrecking the whole appliance. It is taken for granted that a retainer fixed by cemented bands is the only kind to be seriously considered for general work. No other kind can really be depended on except for the simplest things, and even then the patient's disposition to wear a retainer is the thing depended on rather than the retainer itself. With most children this disposition is entirely too uncertain for any risk.

Frequent Removal Advocated.

But a fixed retainer should not be too fixed. It should be removed entire every three or four months, the teeth well cleaned and examined for any threatened decay, and then carefully recemented in place. Where there is a strong tendency to dental decay the retainer should be removed and recemented oftener. This removal is not hard, as cemented clamp bands usually peel from a tooth upon loosening the screw, and the cement can usually be broken and worked out from plain bands by means of small instruments like an explorer or a very small, thin spatula. This frequent removal gives a chance to make any changes desired from time to time, and allows a gradual elimination of parts, thus gradually releasing the teeth from the support of the retainer, a few at a time. This involves little risk, for if the occlusion fails to hold the released teeth it becomes evident in a very short time, when these teeth may be readily handled further and got into correct position, and then either retained longer or retained in a different way and still not jeopardise the whole case.

The application and removal of a retaining appliance should be as easy as the application and removal of a regulating appliance, otherwise proper attention to retention will hardly ever be given. When it takes from one to ten hours' time to remove and reconstruct a retainer, it is inevitable that such work will not be as frequent as it ought to be. But with a sectional retainer, with either the whole or any particular part or band easily removed and as easily put back, proper attention to the whole matter of retention can be given with little trouble. And when a thing *can be* easily done it usually *is* done.

Construction of Retainers.

The construction of retaining appliances after the plans just discussed is, of course, open to many variations according to the conditions of the case and according to the individual preferences of the operator. When the dental arch has been expanded considerably, especially with lateral expansion extending back to the molar region, a stiff and close-fitting bar or arch on the lingual side of the teeth will be found the most satisfactory base for a retainer, this bar or arch being rigidly held in place by bands cemented upon appropriate teeth. By placing the supporting bands upon the proper teeth, usually the lateral incisors, and by means of proper spurs or bars on the labial side of these bands, a whole dental arch can usually be retained with about four bands. With the posterior bands adjustable and also detachable, the anterior part of the appliance can be put on first, with plenty of time for easy and proper cementation, the clamp bands being applied one at a time later on. A retaining appliance of this general pattern will be found applicable to a large percentage of cases, and very satisfactory in results, as it holds the teeth well in place while it gives them to a large degree the necessary freedom of movement during retention, and at the same time is easily made, easily applied, and easily removed.

The lingual arch should be round, to afford the least contact with the teeth and the least lodging place for food; a flattened lingual arch or semi-plate is undesirable. Either iridio-platinum or clasp metal containing a good percentage of platinum (Ney's preferred) is the best material for the lingual arch, as it must remain good and stiff after soldering up, enough so as to resist the inward tendency of not only the teeth, but the inward springing of a considerable quantity of quite elastic bone. The lingual arch should seldom be lighter than No. 16, American gauge, and often should be as heavy as No. 14. An arch of ordinary gold, or clasp metal with a small percentage of platinum, or any of the base metals, is practically worthless for the purpose.

The lingual arch should be fitted to a model of the case rather than to attempt to fit it in the mouth. It can be bent to fit with pliers perhaps easier than any other way, though it is not difficult to make a Melotte's metal model of the teeth and swage the arch to shape over this. It should be very accurately fitted by whatever method to be certain of good results. After it is either swaged or bent to shape the arch is ready to be soldered to the anterior supporting bands. This should be done upon a model rather than to hold bands and arch together with pliers. The model should be of investment compound, and the arch bound down tightly to place with heavy iron binding wire. By soldering up directly on the model the arch and bands are always in proper alignment, a thing not always certain otherwise.

While only one form of the lingual arch appliance has been described, it must not be supposed that this is the only pattern of that useful device. There are many variations possible, but the writer wishes to touch only upon the general points of the appliance in this paper, pointing out also the fact that it is entirely according to the principles of retention that have been formulated, leaving a more detailed consideration to some future time.

Discussion on Paper of Dr. Brady.

Dr. D. Willard Flint, Pittsburgh.

This paper deals with generalities, and there is not anything new to attack. I quite agree with the author of the paper that in making attachments there is no better way than by working on models. The proper adjustment with retainers is what we are all seeking. As regards removing retainers every three or four months, I do not see the necessity of doing that if the bands are properly placed in the beginning and properly attached in between. I do not know whether Dr. Brady is placing bands under the free margin of the gum and festooning the same or not. If he is not, he will have occasion to look carefully after his bands. The only necessity for removing bands is when some accident has occurred, according to my way of thinking.

As regards the arch material, he speaks about using fourteen or sixteen gauge, but my experience has been in using iridio-platinum that we could not afford to use much fourteen gauge wire. I would fear some of my patients might die before I got it back again. I think the essayist must have a different kind of gauge to what we use in our town. I do not know whether he made a mistake in putting that in his paper or not.

Dr. J. A. Burrill, Chicago.

I agree with the essayist when he says that retention in orthodontia is not the simplest principle, but I was rather disappointed when he spoke so generally on the topic of retention and did not give us an improvement on anything we had used or known before. There are a great many things in connection with retention he has not considered, and one of these is the retention of open bites; and how long to retain the teeth. I have found it is absolutely impossible to judge how long to retain a rotated incisor, and I find after two years' retention they will tend to go back even in apparently absolute and perfect occlusion. I do not think it is necessary to wait for absolute occlusion before we apply retainers. I find it advisable or advantageous very often to adjust a part of the retainer and make my little readjustments with that part of the retainer. He uses the lingual arch. I use it a great deal. I find sometimes when I want to put the lingual arch in place, if I were to make a metal die and swage an arch to fit that accurately, it would not be what I wanted. I cannot get things to settle into the perfect occlusion he tells us about.

He says that clamp-bands can be used on bicuspids and molars. There is a difference of opinion there. Clamp-bands are all right, and I use them almost entirely on molars, but never could find room for a clamp-band on a bicuspid in a retainer as well as a clamp-band on a molar. They are too cumbersome, and it is a little hard to fit a screw post to a bicuspid. In the retainers that have simplicity and efficiency, I do not think it is necessary to remove them every three or four months to cleanse the teeth. If they have simplicity and efficiency, you can discover decay without removing them. If the bands are thoroughly cemented in place, the teeth cannot decay under them. Cement adheres rigidly in my cases to the teeth and not to the bands.

I want to take some exception to the size of wire he uses in his lingual arch. I think such a large piece of clasp metal or German silver would be so cumbersome and so heavy as to render it absolutely impossible to make a fine adjustment to the teeth.

There are a great many things that confound us in the matter of retention. For instance, a thing that has bothered me is how to hold the bite closed when once it has been open and closed. How are you going to hold it closed? We have not the force of occlusion to hold it there. That is one feature of retention that has bothered me more than anything else. I flatter myself that I can put a tooth anywhere I want it, but I cannot always make it stay there. Even after I have retained it for a considerable length of time, it will not always stay.

Occipital and Cervical Anchorage.

By Carl B. Case, D.D.S., Milwaukee, Wis.

Application of power from a base of anchorage other than the teeth has probably received less attention in proportion to its practical value than any other method of applying or sustaining power for orthodontic purposes.

Though it is impossible to go into this subject exhaustively in the short time allotted to me, I shall endeavor to place it before you in such manner that the applicability of the occipital force with its variations may be readily comprehended.

Years ago it was determined that the available anchorage teeth did not furnish, in all cases, a sufficiently sound and stationary pier, however firmly they were attached together, from which to apply either a positive screw force or an elastic tension for the distal movement of anterior teeth. In natural sequence it followed that a base of anchorage other than the usual anchorage teeth would be extremely desirable.

This idea ultimately resolved itself into the so-called "Headgear," a skeleton cap designed to be worn over the occiput from which a retractive force could be applied to the upper anterior teeth through the medium of an external bow and elastic ribbons, thus relieving the customary anchorage teeth of the reactionary strain and utilizing them principally to maintain the movement secured by the external elastic force.

Although the various devices evolved for applying the occipital force operate on the same general principle, the essayist, from long acquaintance and practical knowledge of its working capacity, desires to recommend one particular apparatus for various important reasons which will be readily appreciated (Fig. 1).

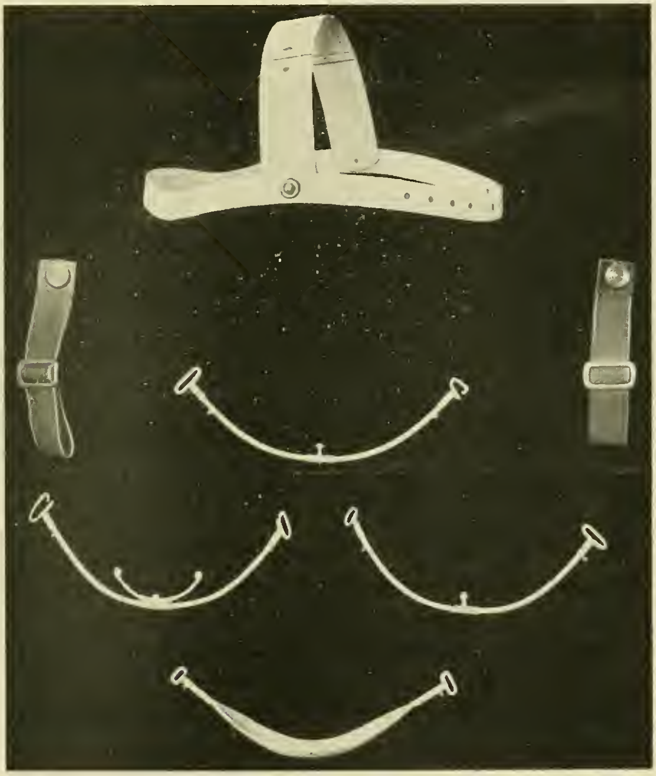


Fig. 1.

The cap is constructed entirely of thin, flexible metal ribbons, which cause it to fit the head closely. The circlet and top band are riveted together by the device known as a "glove fastener," which permits the cap to be folded and provides means for the ready attachment of the elastic ribbons. It is easily adjusted to any size and shape of head over which it evenly distributes the reactive pressure. These are but minor points which are brought out in describing the apparatus.

The principal reason why this device is most efficient is because of the several interchangeable attachments which permit of the application of force at various points upon the teeth and which, consequently, render the apparatus peculiarly applicable in a variety of classes of malocclusion and malposition.

An important feature which is common to all of the bows as well as the chin retractor is the swivel loop for the attachment of the elastic ribbons. This is so constructed that it lies flat against the cheek and affords a quick means of attaching or detaching the elastics.

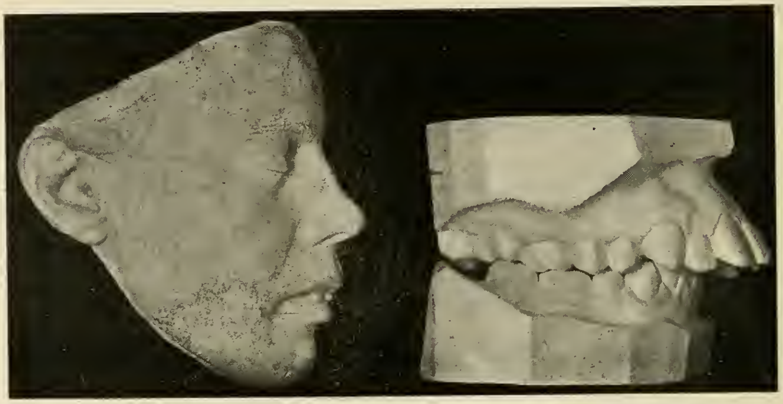


Fig. 2.

The "screw post bow," which exerts a retractive power upon the incisors, is held in place on the alignment arch by an open-tube attachment at the end of the screw post. The latter is capable of being adjusted to increase or decrease the distance between the bow and the teeth.

The "buccal adjustable bow" is provided with arms which attach to the alignment arch on each side. The arms are secured by a set-screw and can be lengthened or shortened as desired.

The great advantage derived from the "buccal adjustable bow" is that power can be applied to the cuspids, to the posterior teeth separately or combined, or to the entire arch, and probably to the lower teeth as well as the upper.

The "lower bow" was devised for retruding and extruding the lower anterior teeth in cases which might require such treatment and has been found very satisfactory.

The "chin retractor" is constructed of a thin pliable wire mesh which allows it to be easily shaped by hand. When in use its flexibility causes the retractor to adapt itself to the chin against which it rests.

In conjunction with these power-transferring attachments, the apparatus offers a very serviceable method of applying an advantageous regulative force.

Full Upper Protrusion.

Consider first the type of dental and facial deformity illustrated by Fig. 2, which the system favored by the essayist is pleased to classify as the "full upper protrusion" and which at first glance is suggestive of the occipital force.

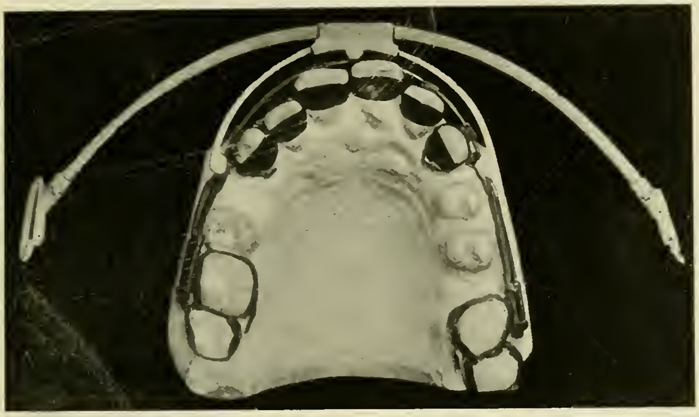


Fig. 3.

There is but slight doubt that the difference in opinion, which obtains among orthodontists relative to the diagnosis and methods of treatment of all cases of similar character, will be maintained for years.

The use of the intermaxillary force is favored by many. Extraction of teeth is advocated by an equal number. Since the views of each faction are recognized and upheld by a large following these points need not enter into this discussion as the subject in hand deals solely with the "external anchorage" and the possibility of attaining superlative results by its consistent use.

Although the occipital anchorage may be employed to great advantage, as will be shown, it is not to be inferred that the apparatus is to be utilized to move the entire upper dental arch distally to a normal general relationship with the lower. Such a movement, even were it possible, would be decidedly unpractical.

It being considered impossible to maintain the full complement of upper teeth and physiologically move them all distally to their proper cranial position, the first upper right bicuspid was extracted—one of the left molars having unfortunately been lost some years previously—thus providing a sufficient space on either side to retract the anterior teeth the required distance to establish a good interdigitating occlusion, and consequently reduce the facial deformity which was caused by the anterior position of the upper teeth alone.

It is needless to enter into a description of the appliances employed for this purpose. Suffice it to say that a retractive screw force was first applied to the cuspids. Although the stationary anchorage fixtures firmly incorporated three teeth each, the apparatus being similar to Fig. 3, without incisor bands or the alignment arch, it was discovered that the anchorage teeth on each side were gradually being drawn forward while little impression was made on the cuspids.

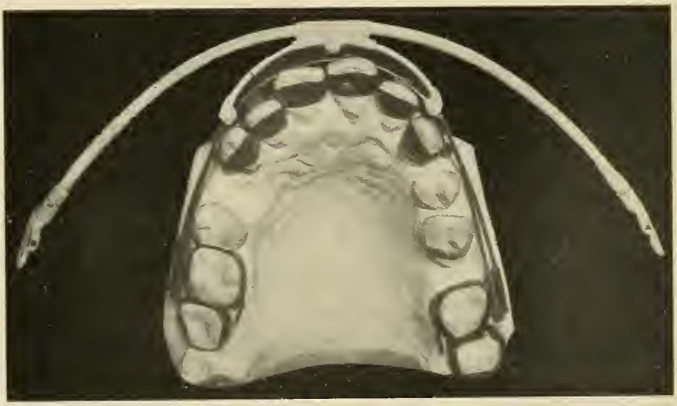


Fig. 4.

The retractive force was immediately discontinued and pressure brought to bear directly upon the anchorage teeth through the medium of the occipital anchorage and the buccal adjustable bow with the result that in a consistent length of time the molars and bicuspids were caused to assume their original position.

It is extremely doubtful if this result could have been attained through the use of the screw post bow which transfers the pressure to the anterior teeth and which is apparently the only method of applying the occipital force to the teeth with other devices.

It will be seen that the adjustable arms of the bow, which are capable of being lengthened or shortened at will, slide at their ends upon the alignment arch against short sections of tube, or against a wire span on each side, thus bringing all of the retractive force to bear directly upon the anchorage teeth.

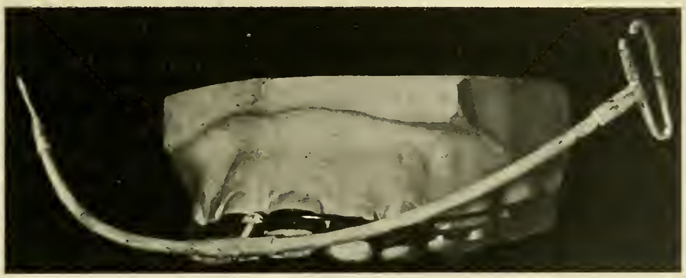


Fig. 5.

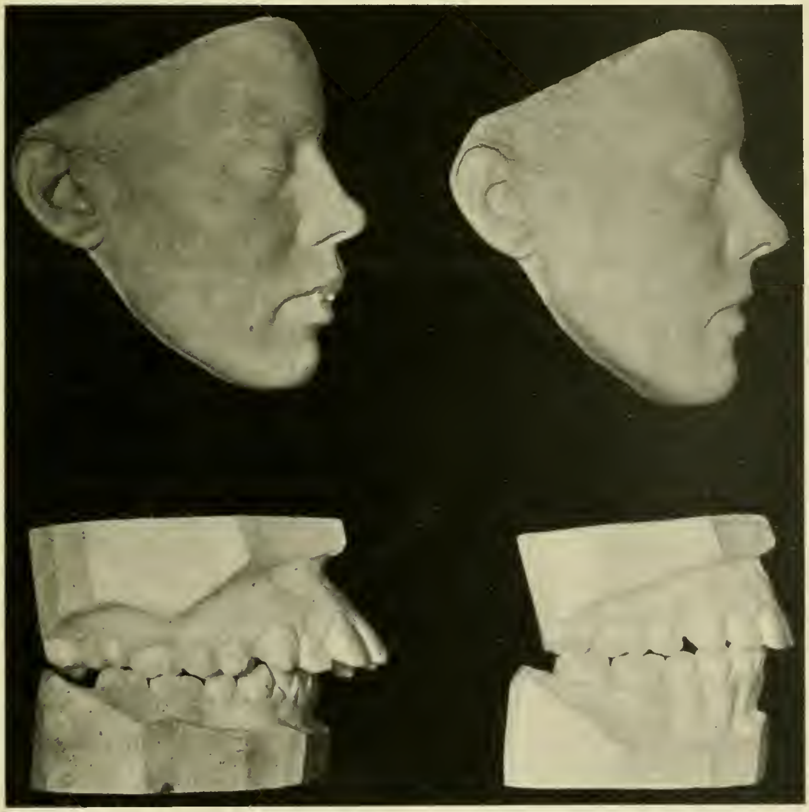


Fig 6.

The apparatus shown in Fig. 4 could have been primarily employed to advantage in two ways, either to reinforce the anchorages as the cuspids were being drawn back by screw and elastic force, or to transfer the pressure exerted by the elastic ribbons directly to the cuspids, as was finally done.

The screw post bow, as shown in Fig. 5, was ultimately substituted for the buccal adjustable bow for the purpose of retruding and intruding the incisors, although the use of the buccal bow might have been continued with good results by further shortening the arms so that their ends rested upon the alignment arch on each side between the central and lateral incisors.

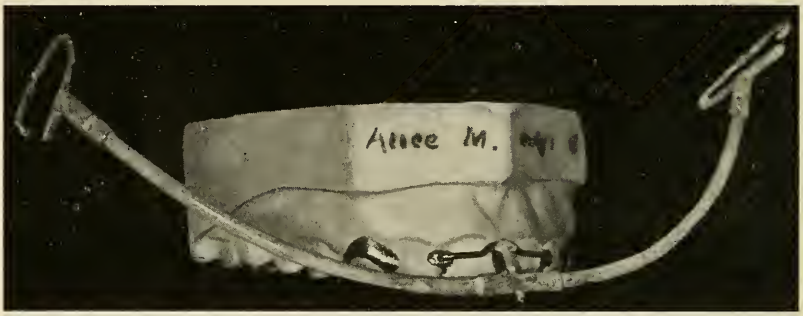


Fig. 7.

From the time when the occipital force was first employed the anchorage teeth were used solely for the purpose of maintaining the movement secured and not as a base from which to apply force.

The final result, illustrated in Fig. 6, can be attributed alone to the consistent use and efficient action of the occipital anchorage and force. This apparatus, in connection with the post bow, was further utilized in the manner shown by Fig. 7, to reinforce the retaining fixture and assure permanency of the result.

The retrusion and intrusion of the incisors may even be continued if desirable by increasing the strain of the elastic ribbons.

Open Bite.

The class of dental deformity styled "Open Bite," Fig. 8, which is frequently complicated with a bimaxillary protrusion, requiring the extraction of upper and lower bicuspids, can be judiciously treated with the occipital force and its variations with greater chances of success than if the usual treatment with screw and elastic force alone is depended on.

Although the direction of pull exerted by the occipital force in conjunction with the lower bow, as shown in Fig. 9, is well adapted to the retrusion and extrusion of the lower anterior teeth and has been employed advantageously for these purposes with the lower retaining fixture, such a force would have little beneficial effect in the movement of the upper teeth as the upward pull would undoubtedly defeat the object of extruding them.

It was perceived that a base of anchorage from which a retractive force could be applied more nearly parallel with the line of occlusion would be of great advantage.

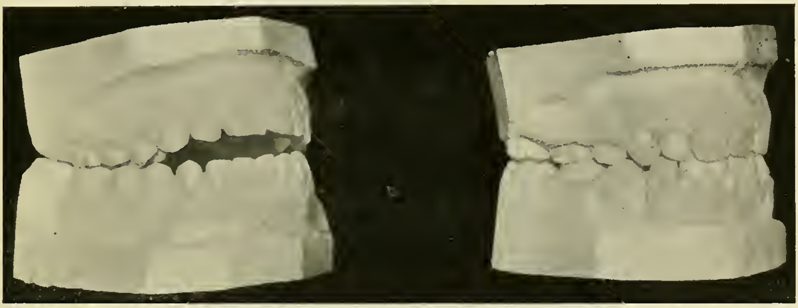


Fig. 8.

Several ineffectual efforts have been made to reduce the slant or to "horizontalize" the line of occipital force. The failures have undoubtedly resulted from holding to the occipital cap as the anchorage base.

Each make of occipital apparatus has a variation which permits of two elastic attachments on each side, but if any change is effected in the direction of the line of pull on that account it is so slight that no practical advantage is gained.

In December, 1910, the writer considered employing the neck or base of the skull to sustain at least a part of the reactive force and devised the apparatus shown in Fig. 10.

This consisted of a metal plate which fitted the back of the neck quite perfectly. Its object was to sustain the rear bow, which attached to the cap at its forward ends and afforded an anchorage for the elastic ribbons.

Although this device provided the means of applying an effective force in the desired direction, it was ultimately discarded on account of the probable discomfort caused the patient.

Cervico-Vertebral Anchorage.

The experiment, however, served its purpose in proving that the neck could be used as a base of anchorage, probably unassisted, to support a horizontal line of force with the result that the collar, which may be appropriately termed the cervical or cervico-vertebral anchorage, was constructed of silk covered canvas and provided with a series of hooks and eyes to allow its adjustment to any size of neck. (Fig. 11.) To the back of the collar is fastened a broad metal distribution plate of proper shape to fit the neck closely. As its name implies, the plate distributes the reactive force over the back of the neck so liberally that practically no irritation or discomfort is caused.

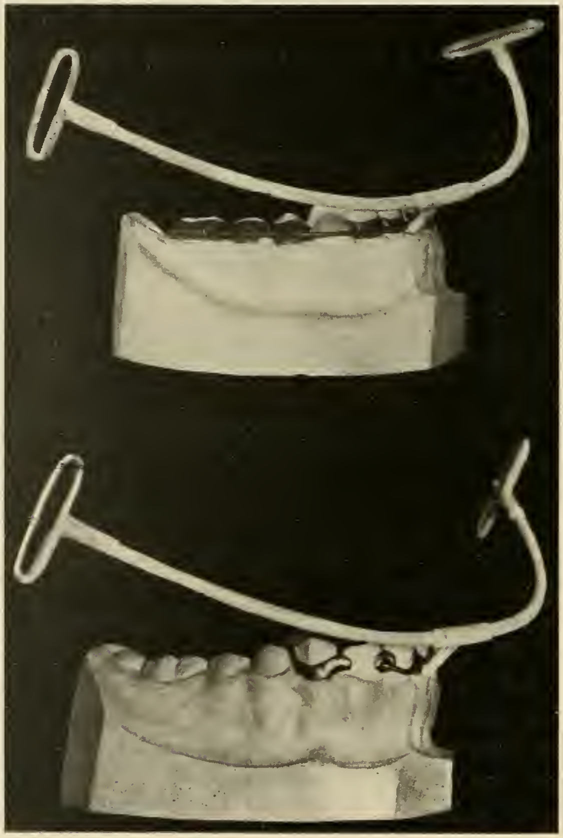


Fig. 9.

The rear bow, which affords an anchorage for the elastic ribbons, is attached to the distribution plate in such manner that it is capable of a slight lateral movement. This equalizes the elastic pull on each side, without causing the collar to change its position when the head is turned.

It is obvious that this apparatus should undoubtedly prove efficient in all cases of dental malposition, where a horizontal direction of pull sustained by an anchorage remote from the teeth is considered an advantage.

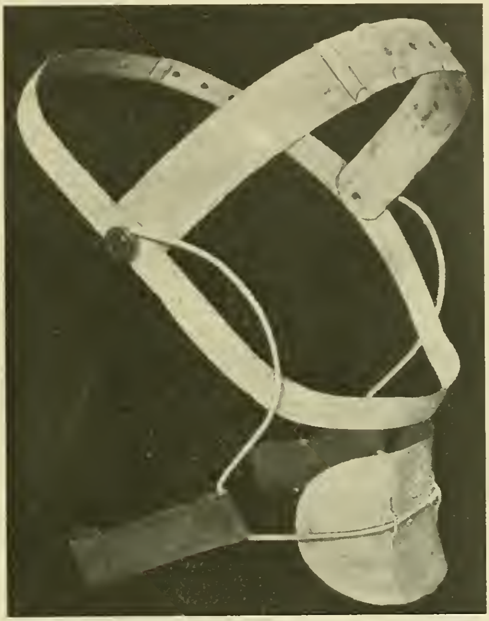


Fig. 10.

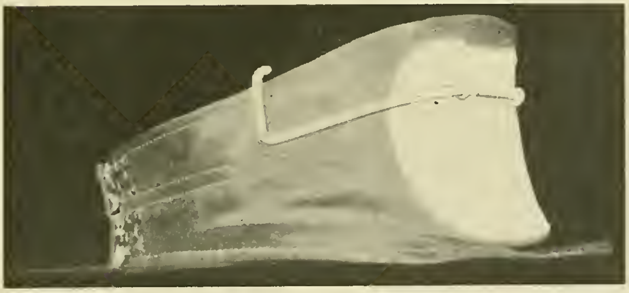


Fig. 11.

Although a practical demonstration of applying force to the lower teeth through the medium of the cervical anchorage has not yet as yet been attempted, there is probably no question that it can be done advantageously.

The greatest difficulty to obviate will be the form of the adjustable bow which must be so shaped that it can be readily worn without discomfort.

Chin Retractor.

The chin retractor, which has supposedly contributed largely to the utility of the occipital anchorage, has but little practical value.

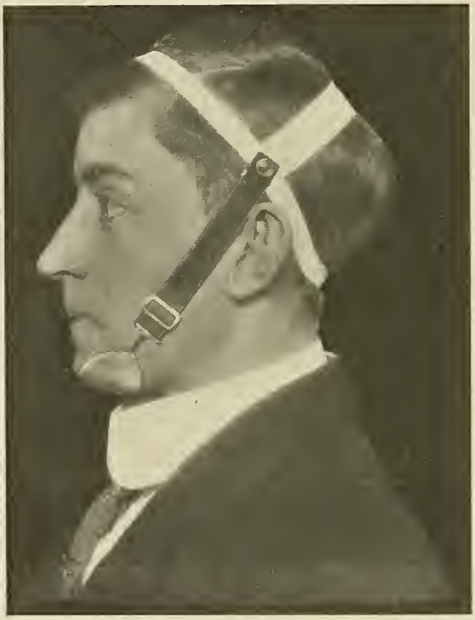


Fig. 12.

At the age when the chin retractor might be employed to advantage to retard the development of the mandible or to maintain it in a posterior position, the bones of the head and face are not fully developed, and there is no way of determining what results Nature will effect in them. The most praiseworthy efforts with the chin retractor at this age might result unfavorably.

At the age when it can be safely applied. its capacity for accomplishing the object for which it was devised is so slight as to render it almost worthless.

The full value of the cervical anchorage cannot be estimateed at this time. The principle of applying a regulative power to the teeth from an external anchorage has never before been attempted in this manner so far as it has been possible to discover.

If experimental investigation proves the principle to be sound, there is assuredly no question that the efficacy and applicability of the external anchorage will be greatly increased.

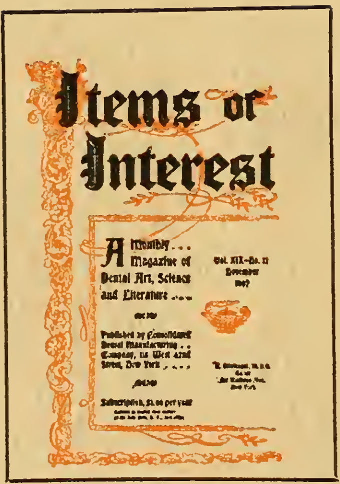
Discussion of Dr. Case's Paper.

Dr. Frank M. Casto I did not know that I had been selected to open the discussion on this paper. I have not had very much experience with occipital anchorage or cervical anchorage. As I understand, Dr. Case has presented the technic of occipital anchorage to be used in such cases as the operator may select, or in such cases as he may decide it would be indicated. I think the appliance he has presented would be quite efficient, and I believe that in any case where it is indicated, we might not know of anything better, and I believe it is a good thing to present here because undoubtedly there are certain conditions where it may help some. But Dr. Case excluded a discussion of the particular treatment in these cases and there is not very much left except the technic of the appliance. I have used occipital anchorage as a supplementary anchorage in Class 3, and in some cases of Class 2, Division 1, to overcome more or less instability from the continued use of the intermaxillary force.

Dr. William E. Walker, New Orleans. I believe, in cases where it is necessary and desirable to use cervical anchorage, it will be found efficient and comfortable in the form Dr. Case has advised, judging from the experience I had in one case in which I did not use such a nice device, but a piece of cigar board with holes in it and a string. I used it in 1889. It was successful in drawing back the six anterior teeth.

Dr. C. C. Grisamore, Chicago. I have used these appliances that have been spoken of by Dr. Case many times with good results in two classes of cases. In one class, where you want supplementary anchorage, where you use intermaxillary anchorage and the upper teeth are not moving just fast enough, if you put on this anchorage it gives satisfactory results. The other cases in which I have used them with good advantage have been in those of open bite malocclusion, and the tendency of the anchorage is to raise the lower teeth and elongate them, with a tendency to shorten the upper back teeth. I have never tried the cervical appliance, but I can see a place for it, since the tendency of the occipital force is to elongate the lower teeth and depress the upper. In cases where you want supplementary anchorage and do not wish this change in the teeth, I can see where cervical force can be used to good advantage.

Dr. Carl B. Case. There is very little to say in closing the discussion. I am one of those who believe in having a number of devices that I can use in certain cases, although a large number of the appliances which we have on hand were decried at Cleveland a year ago. But the work we are doing is serious enough to have appliances which can be adapted to the individual case, and where stereotyped appliances cannot be used. We cannot have too many appliances. Therefore, in my paper I have introduced another method of applying force which may possibly obtain results which cannot be had as easily by any other method.



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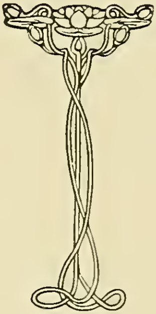

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Dates and Places of Meetings of The American Society of Orthodontists

First Annual Meeting held at St. Louis, Mo., June 11, 12 and 13, 1901.

Second Annual Meeting held at Philadelphia, Pa., October 8, 9 and 10, 1902.

Third Annual Meeting held at Buffalo, N. Y., December 31, 1903; January 1 and 2, 1904.

Fourth Annual Meeting held at St. Louis, Mo., August 29, 1904. At this meeting only routine business of the Society was transacted. There being no other program the proceedings were not published.

Fifth Annual Meeting held at Chicago, Ill., September 29, 30 and October 1, 1905.

Sixth Annual Meeting held at New York City, December 27, 28 and 29, 1906.

Seventh Annual Meeting held at Detroit, Mich., October 2, 3 and 4, 1907.

Eighth Annual Meeting held at Washington, D. C., November 5, 6 and 7, 1908.

Ninth Annual Meeting held at Cleveland, Ohio, October 4, 5 and 6, 1909.

Tenth Annual Meeting held at Denver, Colo., July 13, 14 and 15, 1910.

Eleventh Annual Meeting held at Boston, Mass., September 20, 21, 22, 23, 1911.

Twelfth Annual Meeting held at Chicago, Ill., July 1, 2 and 3, 1912.

Thirteenth Annual Meeting held at Chicago, Ill, June 30, July 1, 2, 1913.

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President's Address.

Anent Recent Tendencies in Orthodontic Theory and Practice.

By B. E. Lischer, D.M.D., St. Louis.

Read before the American Society of Orthodontists, Chicago, June 30; 1913.

Mr. Vice-President and Members of the American Society of Orthodontists:

For the honor conferred upon me on this occasion I feel deeply grateful. Though conscious of the meager qualifications with which I approach my task, I shall endeavor, nevertheless, to briefly occupy your valuable time with a discussion of sundry recent tendencies in orthodontic theory and practice.

If we seek the cause of progress in human affairs we usually find, for every advance, the resolute activity of some co-worker who has both a knowledge of the past and a vision of the future. But it frequently happens that his angle of vision is not our angle; he occupies, for the moment, a vantage point which many of us have not yet reached, or, perhaps, have already abandoned. This gives birth to a rivalry which, in science, is usually courteous.

Recent orthodontic progress, alas! has not been free from discord. The desire for supremacy among our leaders has added its note of acrimony as well as amity. The battle that has been raging between hostile camps on the orthodontic field has elicited such a flood of articles—many of which display considerable spleen and prejudice—that truth has suf-

Reprint from Items of Interest

fered. And though we willingly admit that these numerous, unremitting attempts to advance the art in various directions have been responsible for the birth of the new order—for many of them contain much that is good—it is evident that the bitterness of the contest has been unnecessarily prolonged. Indeed, the average practitioner takes little interest in this clashing of swords, or at least soon tires of the roar and turmoil, and during reflective moments he very rightly asks: "Have matters been clarified? Are the new teachings sound? May we safely sanctify them by the name of *science?*"

It appears a reasonable undertaking, therefore, to briefly examine our progress, to feel the pulse, as it were, and, if necessary, to apply a little diagnosis. To paraphrase a statement from a recent address by President Jordan, of Stanford University: Orthodontics is now on the firing line of the advance of science. It has left behind it as outworn garments many dental theories, and all schools of orthodontics. Orthodontic advance is the work of no school, the offspring of no preconceived theory.

Causes of Malocclusion.

From time immemorial it has been an ambition of the human mind to know the causes of disease and deformity, twin infirmities of the flesh. Since the days of Fauchard and Lefoulon there has been a continuous effort to discover the causes of the anomalies of dentition. Gradually, and with an increasing appreciation of their importance in prevention as well as cure, investigators have discovered many of the causative factors of oral deformities.

Prior to the days of specialization, when only the general practitioner dabbled in matters orthodontic, the causes of malocclusion were but lightly considered; much teaching concerning them was readily accepted, regardless of its scientific accuracy. Hence the literature of earlier days abounds in many vague and inaccurate statements which, unfortunately, percolated through the sieve of time and served us far longer than their merits justified.

It is not my intention to here enumerate the accepted causes of malocclusion, nor to weary you with those arguments which have shattered or upheld the theories of old. But in this connection, and within the limited confines of this address, it seems eminently appropriate to call your attention to an important tendency of our time, a tendency which even the casual reader of our literature cannot fail to observe. I refer to the proneness on the part of many orthodontists to wholly reject, or at least severely question, the rôle played by heredity in the causation of malocclusion.

We recall the time when heredity explained many otherwise unexplainable phenomena, when it served as a cloak for our ignorance, when many diseases and most deformities were believed to have been transmitted from generation to generation. In those good old days heredity was, in fact, an entity, a force; and probably more frequently for ill than for good.

But the vast extension of our knowledge during the last half century, encompassing an era in science which is now briefly termed *Darwinism,* has forced every science "from geology to psychology to accept what Darwin proclaimed as to biology—the law of development." And in this latter field the application of his method has been nothing short of revolutionary.

One of the most important lessons which we have thus lately been taught is that we no longer "spell heredity with a capital 'h.' We no longer think of it as a power or as a principle, as a fate or as one of the *forces of nature;* we study it as a generic relation which is sustained by a visible material basis, as a relation of resemblances and differences which can be measured and weighed, or in some way computed."

Much of our recent progress in this department of biology is due to the epoch-making labors of the German investigator, Weismann, of Freiburg. He was the first to call our attention to the fundamental significance of the contrast between germinal variations and bodily modifications. His contentions, that the germ-nuclei are the bearers of heredity; that the germ plasm possesses a continuity not true of somatic cells; that owing to its relative apartness from the everyday metabolism of the body acquired modifications are not transmitted, have been severely questioned, but not disproved.

These are facts of exceeding importance, and we need not wonder that they have finally entered into the discussions in our own field. To the extent, then, that our recent writers stand on this firm scientific groundwork, they stand plumb and true; but let me hasten the suggestion that many of them are out of plumb, and not a few are "opponents of heredity" for no other reason than that it is fashionable so to be. For if their arguments were well grounded in fact they would not indulge in statements as bad as or worse than their heredity predecessors.

Of course, this whole movement in opposition to heredity, if I may so express it, has come as a healthy antidote; we were sorely in need of it. But let us not stop there. Indeed, if there is one feature of the etiologic problems that stands out more prominently than the rest, it is this: All dental research thus far conducted is entirely inadequate.

Another phase of this tendency well worthy of note is the underestimation now placed upon clinical data and case histories. The reason usually assigned for this indifference is that the personal equation enters too largely into such records. That this may occasionally be the case is undoubtedly true; not all investigators have a "passion for veracity." But I ask you to contrast our indifference with the "vast amount of investigation into the laws of inheritance of human traits" now conducted by biologists throughout the scientific world. One need only mention the Department of Experimental Evolution, Cold Spring Harbor, L. I., under the directorship of C. B. Davenport, or the Eugenics Laboratory and its publications, of England, under the able leadership of Karl Pearson, to realize that case histories are quite worth while.

One is reminded here of a statement by Davenport, that "Modern medicine has had its attention too exclusively focussed on germs and conditions of life. It has neglected the personal element that helps determine the course of every disease. It has begotten a wholly impersonal hygiene whose teachings are false in so far as they are laid down as universally applicable. It has forgotten the fundamental fact that all men are created *bound* by their protoplasmic makeup and *unequal* in their powers and responsibilities."

As stated above, I cannot here enter into a detailed discussion of the factors of causation; my aim is merely to call your attention to the general drift of current thought, and how orthodontic opinion is at variance with the best science of to-day. And finally, I am quite certain that before long we will all admit that various anomalies of dentition *are* transmitted from generation to generation, *e. g.*, anomalies of number, anomalies of form, some anomalies of position (transversion and perversion), as well as abnormal developments of the *frenum labii.*

The intimate relationship existing between dento-facial deformities and abnormalities of the nasal passages and their accessory sinuses are demanding increased consideration. The development of the supporting osseous structures beyond the teeth is thus viewed from the broader standpoint of normal function.

Pickerell is of the opinion that it is difficult to determine, when adenoids and arrested development of the jaws are found associated, which of these is cause and which is effect. Indeed, he is "strongly inclined to the opinion that adenoids are the effect." He maintains that the nutritious foods of to-day lead to an avoidance of mastication, then to narrowed under-developed dental arches, these to mouth-breathing, after which "adenoids develop in the stagnating nasal cavity."

Diagnosis of Malocclusion.

Another very noteworthy tendency of present-day theory and practice is our attitude toward the problems of diagnosis. In these days of the "systems," with their truly remarkable achievements in technique, we are prone to rest content with our superficial calculations—for we love to cling to seeming bounds. Hence a discussion of our shortcomings and difficulties is frequently looked upon as a needless disturbance of a fairly satisfactory routine.

How unfortunate it is that so many cases of malocclusion are complex; that several and various deviations from normality so frequently conjoin in a single case. But bewail the fact as we may, it is our duty to discover and work out in detail the morbid anatomy of every type of dento-facial deformity. And in doing so, we must exhibit a liberalism that characterizes all true science.

In a previous communication the historical development and fundamental considerations of this subject were set forth. The importance of a careful differentiation between basic pathological conditions and superficial symptoms were thus emphasized. The need for an improvement in nomenclature was not only pointed out, but a group of terms was actually proposed. Continued use of these terms in practice and teaching by several friends and co-workers has not only re-enforced our faith in their practicability, but has extended our perception of hitherto unrecognized abnormalities which enter into malocclusions. Thus malposition of the mandible (Federspiel), which previously was unknown, is now regarded as a factor of great significance in distocclusions and mesiocclusions which have passed beyond the developmental period.

Facial Deformity.

But one of the most significant phases of the subject of diagnosis which, it seems to me, has not yet received the attention which its importance demands, is that of facial deformity. Thus far we have had but two fundamental contributions on the subject, and, strange as it may seem, they are diametrically opposed to one another. Thus, on the one hand, we are taught the supreme importance of the full complement of teeth and the imperious hypothesis of ideal occlusion. Accordingly, the outward form of the changeable area of the face is dependent upon the relative normality of the denture within; and that, as a rule, it is best to establish normal occlusion and thus strike a balance of the features which is rarely, if ever, wrong.

On the other hand, it is proclaimed with equal emphasis that the full complement of teeth is not necessary in the treatment of certain types of malocclusion; in some instances extraction of one or more teeth is positively indicated. The operator's ideal of facial form is the criterion we are thus asked to accept. It is presumed, of course, that this be a cultivated ideal, carrying with it that fine discretionary ability to say when teeth shall be extracted, or moved bodily, for the improvement of facial balance.

I need not further expound the arguments of either view here; they are familiar to all. I wish merely to direct your attention to several involved problems which are of the greatest moment, but which are rarely mentioned.

Did it ever occur to you that the former view, though a strong crutch to lean on, is dangerously orthodox? Are our tasks really as simple as this arbitrary faith thus proclaims them to be? It is good practice to treat every case according to the fixed routine thus implied, and to mislead our patients and their parents, as well as ourselves, into the belief that ultimately a normal facial expression will obtain, no matter at what age the treatment be instituted? Will a restored occlusion always promote growth of short, thin, upper lips, and diminution in size of enlarged lower lips? Is occlusion a therapeutic agent of such marvelous power that deficiency or redundancy of the symphysis, malrelations between the occlusal plane and aperture (*rima oris*) malformations of the jaws and malposition of the mandible, will all finally be corrected by it? These are problems of compelling interest and merit painstaking investigation.

Difficulties of Prognosis.

During the last decade we have witnessed the development of another very important aspect of orthodontics. Though it has for some time been recognized that oral deformities develop gradually, it is only in recent years that the various stages of these maldevelopments have been made a subject of *careful comparative study*.

Just as the physician laboriously observes and records the onset, course and termination of every disease, and finally portrays a clinical picture of each as the sum of all its symptoms or manifestations, so the orthodontist now observes and records the various developmental stages and accompanying deviations of every type of malocclusion. For the first time in the history of our art we seem to fully realize the importance of an early diagnosis; we are now convinced that years before even an intelligent parent recognizes the impending deformity, the alert diagnostician can advise ways and means for its prevention.

Thus slowly, but surely, are we establishing the axiom: *malocclusion and its accompanying deformities are progressive, not static.* In short, the prognosis of malocclusion is equally as unfavorable as that of caries of the enamel; its evil consequences are equally certain. The one great lesson which our recent progress therefore emphasizes is this appreciation of the *evolution of types.* To detect them in their incipiency, to early foresee their ultimate terminations, and to divert the underlying forces into channels of normality—this is one of the highest missions of orthodontics.

Appliances for Orthodontic Treatment.

Our recent literature bears ample testimony of a very substantial progress in the treatment of malocclusion. This is very gratifying, for next to the acquisition of knowledge should come its application.

One of the best evidences that we have entirely discarded the narrow yet popular views of a decade ago is the large variety of appliances now on the market. The ingenuity of many workers and the various difficulties inevitably encountered in the treatment of malocclusion were destined, sooner or later, to promote this advance. The restrictions formerly imposed by the so-called *systems* (such as limiting oneself to one kind of appliances) have finally been repudiated.

Every progressive practitioner seems now to have adjusted himself to the new régime which bids him to use manufactured appliances; it furnishes the necessary leisure for mastering the principles involved in their use, as well as the details of their application. All honor to the men who prophesied, as well as demonstrated, the wisdom of this new departure. The recent triumphs of their far-seeing judgment ought to fill the hearts of those who still labor among us with supreme satisfaction. Thus to have benefitted distant others is the highest reward it is man's privilege to receive.

The bitter struggle which the systems engendered is now viewed as a passing cloud upon the horizon—for systems are wholly foreign to the democracy of science. Hence, the thought that they must finally die, that upon their shattered dreams of approximate finality a greater art will rise, is encouraging, and not at all dispiriting. Indeed, this forward movement has now begun. And the core of this new movement consists, I think, in the comprehension of the importance of a differential diagnosis, the designing of a definite treatment for each type of malocclusion so comprehended, and the mastery and simplification of every such definite treatment.

Improvements in the technical details of treatment will, doubtless, continue to be made; we have not yet reached perfection. But while we thus rejoice in some notable achievements, a becoming modesty is still quite in order when we mediate over the unsolved problems of post-treatment maintenance. Full many a sail of premature enthusiasm has been wrecked on this rocky shore. Thanks to several devoted members of this society, a large part of its cold and forbidding frontier now stands illumined as a result of their untiring labors.

The literature of the last year also bears evidence of an extended acceptance of Dr. Case's contention in favor of the *bodily movement* of teeth. That the new (?) reasons and mechanisms proposed for its accomplishment differ from those of Dr. Case is not of very great moment;

the point which must chiefly interest us here is, that men high in authority and of unquestioned ability now find it advantageous.

Extending the Orthodontic Field.

The necessity for the early treatment of malocclusion, and the benefits thus bestowed upon growing children have abundantly been set forth in recent years. The probable incidence of oral deformities (about 50% of all children) has likewise been intimated in the numerous reports of mouth hygiene committees throughout our land. The appalling discoveries of the frequency of dental caries and oral sepsis have well-nigh blasted the hopes of many conscientious workers in the ranks of this very vital movement. Several of the best-informed leaders have admitted, perhaps reluctantly, that to provide the indicated treatment for the residents of New York City alone would require the services of every dentist in the United States for an indefinite period.

When we ponder these facts we are impressed with the utter inadequacy of all artificial means at our command for combating this grave affliction of the race. But the great work of Pickerell (*Prevention of Dental Caries and Oral Sepsis*) marks the beginning of a new epoch in the science and art of dentistry, and lays the foundation upon which a rational mouth hygiene propaganda must stand.

But what of the children who are afflicted with oral deformities? Would it not require the services of all orthodontists of the civilized world to treat only the more serious cases in Chicago, or St. Louis? And now that we no longer emphasize the esthetic results of treatment, but proudly boast of physiological consequences, of improvements to the child's health, what have we done, what are we doing, to materially extend the field of orthodontics?

Individually we can accomplish practically nothing; collectively we may accomplish a great deal. To go at once to the heart of the matter, I maintain that it is both an economic and an educational problem. Indeed, most of the problems which vex modern society and which demand correction are economic in their nature. As Lester F. Ward puts it: "It has become more and more apparent that improvement cannot be secured through the increase of knowledge, *but only through its socialization.*"

I am not unmindful of the many unsolved problems of orthodontics of the need for an increase of our knowledge. But a fact which needs a wider publicity is, that our present knowledge is already so extensive that a vast good could be accomplished if it were more liberally appropriated by society at large. There are those who are sanguine enough to believe that if orthodontic art deserves extended application, a demand for it will speedily follow. But there are many reasons why this much needed extension of the field of orthodontics is difficult, why it merits a well-organized propaganda, though I mention but two.

First, the economic factor. Fully 80% of the population is financially unable to pay for orthodontic services: and inability to pay implies a denial of that leisure so essential to its appreciation. Numerous statistics might here be introduced in substantiation of the above. Briefly, the remedy lies in a more equitable distribution of wealth.

Second, it is an educational problem. This embraces the lack of culture of the masses already referred to (for which they are in no way to blame), and the lack of facilities afforded the profession for the acquirement of special orthodontic training. There is only one way by which the latter can be corrected, viz., by a large increase in the number of high-class schools where this special training may be acquired.

If orthodontics is the curative art it is represented to be, if the correction of oral deformities is so essential to the health and well-being, as well as beauty, of children—and I firmly believe that it is—then it is a solemn duty of the State and its institutions of higher learning to liberally provide every opportunity and facility to all who seek instruction in this branch of the healing art. And the kind of instruction I have in mind would not consist of a few dry lectures on the theory of orthodontics, such as we still find in many dental schools. Orthodontics (in fact, every dental subject) merits the same facilities, rank and discipline as are now accorded most of the subjects taught in our best university medical schools. This would require, among other things, so-called full-time professors, specially designed clinical lecture rooms and laboratories, etc. Such departments should be open throughout the entire year, both for the benefit of the patients applying for treatment, and for the graduate students in attendance. Large State and private funds will be necessary for financing such institutions; and it is a duty of this society to prepare appropriate resolutions calling the attention of our universities to this worthy cause.

In conclusion, I plead for a more liberal interpretation, not only of past achievements, but of the problems immediately confronting us. I repeat: Orthodontics has left behind it as outworn garments many dental theories and all schools of orthodontics. Orthodontic advance is the work of no school, the offspring of no preconceived theory. Like every other art worthy of devotion, it knows neither country, creed nor race. It gladly accepts the only true test of every human enterprise, business, or profession, viz., *the service which it renders to mankind.*

The Twentieth Century, now well on its way, has given birth to a new *social conscience*, and attaches a social significance to all the deeds of men. The older forms of righteousness, though fundamental concepts of a highly individualistic ethical philosophy and worshipped as ultimate ends of ethical attainment, "have almost become automatic to a majority of the community."

Social ethics, the very life-blood of a democracy, without which it cannot endure, demand an extension of all previous codes. Privilege or profit, any undue advantage at the expense of one's colleagues, in whatever form, are alike censurable and anti-professional. Rightly conceived, every new achievement of the human mind is but a gleam of the glory that is yet to be, the forerunner of yet higher achievement. The rich heritage bequeathed to us by the pioneers constitutes a debt we can only pay by extending its boundaries, and by making it equally accessible to all.

"To have sown in the souls of men
One thought that will not die—
To have been a link in the chain of life—
Shall be immortality."

Edwin Hatch.

Discussion of President Lischer's Address.

Dr. Chas. R. Jackson, Indianapolis, Ind.

We have enjoyed this most excellent address, and there will be more pleasure in store for us when it is in print and we shall be able to read it carefully and digest it. I am so fully in accord with most of what the author has said that I shall consume very little of your time in discussion.

I am glad to hear Dr. Lischer express his sentiments in regard to eugenics. I have never been able to accept the extreme ideas of the anti-inheritance enthusiasts. However, extremes seem to be necessary for advancement in any line, and instead now of attributing everything to inheritance, I think it is only a question of time when we will come back to the more tenable position of our scientists, who tell us that acquired characteristics are never transmitted.

And yet those of you who have read the wonderful experiments of Luther Burbank cannot help but be struck with the fact that not only may these acquired tendencies be transmitted, but they usually are transmitted. if that be true in the vegetable kingdom, why is it not true in the animal kingdom? The thought has occurred to me in the progress and study of eugenics, may it not be possible in a decade or so to carry out experiments along the lines similar to those carried out by Burbank, as applied to the human being, such as selective breeding of the human being. The idea may seem very extreme, but when we think of the wonderful benefit it will be to humanity to learn something about heredity, or whether there is anything in it, it certainly seems worth while. We study everything under the sun except the human, and the human race seems to take care of itself.

In regard to the causes of malocclusion, we have many things to learn before we shall be able to diagnose many of the cases of malocclusion that come to us, and we cannot do it by theory, nor by reports of a limited number of cases. Deductions from one or two cases do not prove anything. Deductions from five hundred cases would give us a basis for a theory that would be worth while.

In regard to failure of development of the normal facial expression following treatment, without extraction, I certainly disagree with the essayist. We all admit, I think, that we have cases in which we do not seemingly have normal development and normal facial expression following treatment where the teeth are left in position, but these are the extreme or exceptional cases. There are many cases in which nature has blessed the individual with normal occlusion, with normal teeth in position, and still we do not have ideal facial contour and ideal facial expression. Why, then, should we expect it in every case we treat? The old adage is "the exception proves the rule."

Mouth deformities and how best to correct them presents a great problem, as the essayist has said. We must also think of what we are going to do for those poor patients who present to us and need treatment, just as we do of patients who come to us for the correction of deformities and are able to pay to have the treatment carried out. I refer particularly to the cases that come to the college clinic, and those of you who have college clinics in orthodontia realize that these cases need some attention, and that some other method is necessary to deal with them. There is a crying need for some change. While admitting that assistants would really be beneficial, still I doubt whether the time is ripe at present for the resolutions that our President has suggested to be presented to State legislatures to carry out this plan. Are we not too young? Does the legislature appreciate the value of our services sufficiently? In other words, should we not carry on an educational program to a greater extent before a resolution of this sort would have the effect which we desire?

I cannot even argue with the author in regard to the sociologic part of his paper, in which he says that one of the solutions of this difficulty would be a more equitable distribution of wealth. It would be a grand solution, and I would like to come back to this earth in a hundred or so years; although it is pleasant enough to live now it would be more pleasant when it is rearranged socially.

I commend the President's address, not only for the sentiments he has expressed, but on account of the pleasure I have had in listening to his reading of it.

Dr. C. A. Hawley, Washington, D. C. In the address of our President, which I have been requested to discuss, we find very much to commend and little to criticize. He broadly and courageously deals with the problems which he selects as most important to bring before this body, and what I have to say will be in the direction of further elaboration of these topics.

In regard to the writings of the past, which he mentions that have been at times possibly of a somewhat acrid character, I will only say in comment that we hope and believe that this society has developed into an arena where any and all questions concerning orthodontia can be discussed broadly as scientific problems, absolutely without personality and without references to previous differences. In other words, we believe that this society is and will be a clearing house if we might so term it, for all persons vitally interested in the science of orthodontia of whatever so-called school.

In regard to the remarks on the present attitude toward the question of the influence of heredity and relation between nasal and mouth conditions, I am able to add nothing to his discussion, which I believe is admirably stated.

In regard to the Angle classification and its possible limitations in not regarding the relation of the face to the denture, I agree with him practically, but it perhaps might be stated in another way. To the general proposition that occlusion is "the basis of orthodontia" no one in this society will disagree. It is not a religion, but a scientific fact. The most earnest claimant that the face must be taken into consideration in classification limits such cases to a very low number and when past a certain age. In all cases in the developing stage there seems to be no disagreement. These cases then must be considered individually and are fruitful subjects for discussion.

But, as the author says, occlusion is a principle, not a dogma nor a religion. I think every orthodontist of experience knows that there are cases that must have what we would call "compromise treatment." Even if all the teeth are present there are cases where an ideal occlusion cannot be obtained. And as a result of some observation I am unable to maintain that the teeth are *always* adapted in size to the individual. The relation of the face to the denture is a question of the individual case and should be so studied and treated. And "normal occlusion" does not by any means solve all our problems.

The author's statement that all malocclusions are progressive cannot in my opinion be controverted.

In another division of his address he discusses one of the gravest problems confronting the orthodontists to-day—the problem of extending our work to the masses of people and the education of specialists. As to the former, if the problem of the simple hygiene of the mouth has grown to such dimensions as to practically stagger the resources of its promoters, what hope is there in view of the well-known obstacles for the wholesale treatment of malocclusion for the masses of people?

I would venture the opinion that the solution is not along that line. Malocclusion of the teeth is unquestionably a preventable condition, and the best work in prevention will likely be found along the line of their normal and vigorous use. If the work of the Research Committee of the N. D. A. is successful, and a fund is established, this society should ask that the work in this direction be started as soon as practicable. Some work has already been done by individuals, and this should be enlarged and simplified until conclusive results be obtained. They would not probably be obtained in this generation, but should be started as soon as practicable.

To the second question, the educational problem, I do not intend to offer a solution, but we know that the colleges are already calling to us for advice, and we also know that the facilities for teaching orthodontia are not adequate.

The requirements for entrance into the field of orthodontia as specialists are not the same to-day as they were ten years ago, nor is the opportunity the same, but this growing requirement has not been met by any school, so far as I know.

In conclusion, while commending the address as broad, able and scholarly, I would not feel that I had done my duty if I did not add one note of criticism. While not wishing to discuss at this time the merits of the President's new terminology, I cannot refrain from suggesting that the word "orthodontia" is still officially recognized in our literature, and that until the society officially repudiates this term it should be used in such communications as a President's address. No doubt our nomenclature is faulty in some respects and needs revision, but until it is officially revised, the recognized nomenclature of the science should be used in papers before this society.

Dr. Allen H. Suggett,
San Francisco.

The President speaks of "orthodontic progress not being free from discord" and of the "desire for supremacy."

Such feelings are frequently followed by an introspection, the resultant impulse being to determine whether the individual is making the best effort and whether such effort is in the best interests of mankind: the desire to improve usually follows. This may well apply to schools.

"Orthodontic advance is the work of no school," yet the stimulus of the work of one school (collectively speaking), whatever the policies of its adherents, will in a measure broaden the view of orthodontia in other men's minds, with the result that their teachings and practice will be modified to conform to the most advanced orthodontic procedure.

With this thought in mind and realizing the need for spreading a general knowledge of orthodontia, the pedagogic method in practice in the University of California a few years ago, whereby students were taught only the fundamental principles, taught how to diagnose and classify a case, and taught to refer the case to the orthodontist, has been eliminated.

A full course in orthodontia technic has been in vogue for many years, and it is now augmented by requiring each senior student to carry to completion at least one clinical case.

The fact that men who practice orthodontia exclusively, confine their efforts to large cities, justifies the latter policy, for the people in smaller communities are equally entitled to such privileges and are equally well able to pay for them.

University Dental Schools should offer the best educational facilities in this subject, just as they do in agriculture or engineering. Subsequent to this, individual effort and associational opportunity are the most desirable ethical means for progress.

The desire on the part of the dental profession to better equip itself for work, manifested in the attendance upon classes of instruction in prosthesis, analgesia, pyorrhea, etc., particularly when such classes are instituted or promoted by manufacturing concerns, indicates the necessity for offering instruction in all advanced dental thought, concentrated, if you please, through the medium of the universities.

The University of California proposes such a measure, to follow the winter holidays, to be given to the profession of the State without expense.

It is peculiar that the orthodontists should have obtained statistics as to the prevalence of cases of malocclusion from investigations in the mouth hygiene movement. That such reports have been accepted and commented on by the President brings to light a new phase in orthodontia, and that is, as one of three important factors in the prevention of dental caries, the other two being mouth hygiene and regulation of the diet. Pickerell's researches on the latter subject are deserving of thorough study by members of every branch of medical science.

I want to emphasize the point that if orthodontia is as important as we think it is, if it increases the masticating surface, thus assisting the stomach, developing the bones of the face, increasing balance, symmetry and beauty, correcting abnormal breathing and increasing the supply of blood to the brain—if this be true, we have indeed a solemn duty to discharge to society. Are we doing as much as dentistry or medicine to extend those great benefits to society? New York and Chicago have dentists and physicians running into the thousands, but they have about a dozen orthodontists to meet such a crying need of two or three million people, for it is estimated that nearly fifty per cent. of the children are suffering from malocclusion. Some States have not one orthodontist. The Republic of Mexico has only Dr. Rojo to save it from becoming a nation of mouth breathers.

The laymen might logically doubt that orthodontia is so important when they see the lack of facilities which we have for teaching it. They would either come to that conclusion, or decide that we had not yet developed to that degree of broadness where we would welcome new recruits into our ranks. There was a time when medicine had the same attitude, and dentistry had it until an even later date.

When I was in college I used to shudder when I read in *The Cosmos* the list of graduates from the different colleges. The recent graduate would not be expected to take the broad view of questions that he would later on. However, we expected more of orthodontists because most of them have had several years of general practice and should be far from falling into the narrow groove that those before them fell into. We see the great need of more competent orthodontists. The university is the natural place to go for that training. The real university invites the farmer, the horticulturist, the stock breeder, the chemist, the biologist, to come and accept the assistance there offered. Instead of dentists paying a big fee for any special training to some traveling specialist, it ought to be possible to get it at the university. There should be a fund by which we could induce any man who has become an authority on any phase of dentistry to come to the university and give a course of clinics or lectures under favorable conditions. We are gathering a vast amount of information, but we are not offering facilities for applying the benefits of that knowledge to society.

If "service to humankind" is our object, then the means of providing treatment for the eighty per cent. of the population mentioned in the address must receive some attention at our hands.

Where a paternal form of government exists, as on the continent, more consideration is shown for the health and welfare of the people who constitute this larger percentage than in this country where the expression of the will of the people is supreme.

Since it is impossible for the present number of orthodontists to render such service, the importance of our work justifies our using every ethical means to provide it; three methods suggest themselves to me: 1. By advocating the practice of orthodontia as a learned profession for men and women. 2. By securing endowments for the establishment of orthodontic dispensaries. 3. By securing a broader recognition of the subject and encouraging better teaching facilities, making it a major subject in the dental schools.

The President's recommendation that we bring all these facts to the attention of the universities is indeed worthy of commendation.

It will not be long before the leading university dental schools will be demanding two years of academic training for admission. This approximates the admission requirements in medicine, with biology, chemistry and physics, as the underlying essentials to the basic subjects in medicine, anatomy, physiology and pathology, all taught in common to students in medicine and dentistry. The field of special study in medical science will add oral surgery and orthodontia to those already well-established divisions, as rhinology and otology.

Thus may our ranks be re-enforced and a greater work in preventive medicine accomplished in justice to the children.

Dr. J. Lowe Young, New York City. I am not going to try to discuss the President's address, because I believe it requires careful reading before an attempt should be made to discuss it; but I wish to call attention to one thing Dr. Hawley said which, I am inclined to believe, will create a wrong impression. I think I know Dr. Hawley well enough to feel that he did not mean to leave the impression on this society that, I am sure, his remarks will leave if they are published. He said that he is convinced that there are cases of inharmony of the upper and lower teeth which make it impossible to bring about normal occlusion without the extraction of a tooth. I do not believe Dr. Hawley will come before us and say that when he has removed a tooth he can accomplish normal occlusion in that kind of case.

Dr. Hawley. It would depend upon your definition of normal occlusion.

Dr. Young. Let me make myself clear. Do you wish to leave the impression on this society that you have seen cases where, after a conscientious effort to establish normal occlusion, you could not do it without removing a tooth from either dental arch? That by extracting you could place the teeth in a more harmonious relation than they were in after your best efforts with all the teeth?

Dr. Hawley. Not to leave a wrong impression, I want to explain these cases. There were two cases brought to me in which the operator, so far as he could see, found it impossible to get any overbite whatever. I studied these cases, and in one of them particularly the mesio-distal widths of the upper teeth from molar to molar was measured, and the mesio-distal widths from molar to molar in the lower also, and the combined mesio-distal widths of the lower teeth were as much greater than the upper, as the upper ordinarily is greater than the lower. In other words, you could not get an overbite without removing one lower incisor. Whether you call that obtaining occlusion or not, I do not know.

Dr. Young. What is the age of the patient?

Dr. Hawley. The teeth were all erupted; the second molars were all in place. I cannot get casts at the present time, but I can get them later. There are conditions similar to that which I have seen, but not so pronounced. In extracting the lower incisor and getting an overbite, I do not know whether you would call that obtaining normal occlusion or not. You could not get normal occlusion without doing that.

Dr. Young. It is said that we must have an overbite in every normal occlusion.

Dr. Hawley. Would you leave a case with the lower incisors extending beyond the upper?

Dr. Young. I have a case in which the central incisors are at fault. I have worked on the case for five years, and I have not obtained an overbite. But I honestly believe that if that case had been taken early enough in life that condition could not have prevailed to-day.

Dr. Hawley. You did not change the width of the teeth?

Dr. Young. There is a disparity in the mesio-distal diameters of the bicuspids and molars. The mesio-distal diameters of the lower biscupids and molars is too great to harmonize with the upper so that there would be an overbite.

Dr. Hawley. How much of an overbite?

Dr. Young. He never had any. There are many cases that never have an overbite.

Dr. Ottolengui. You mean an overbite in the incisor region. There is an overbite in the molar region, is there not?

Dr. Young. That was the point, and this question of treatment of malocclusion, in my judgment, is a question of a handicap. If we allow children to go along until the dental arches may overdevelop, and start in with a pronounced malocclusion, we cannot get ideal results. There may be cases in which extraction is necessary, but let us start to treat these cases earlier. Let us get them at three and a half years of age, recognize them and begin treatment. I do not believe in extraction of teeth unless it is very essential to do so, and I believe normal occlusion is a basic principle in our treatment.

Dr. Ottolengui. I do not think Dr. Young, although he said he did, understood Dr. Hawley. Ordinarily the sum of the mesio-distal widths of the teeth in the lower arch should be such a total that when they are placed in the upper arch the distal surfaces of the lower molars and upper molars will be about in the same vertical plane. Is that correct?

Dr. Hawley. Practically so, not accurately.

Dr. Ottolengui. The sum of the mesio-distal widths in the lower arch in Dr. Hawley's case seemed greater than in the upper arch, so that it could not be brought within the arch of the upper. I do not see what difference it would have made if treatment had been begun at four years of age, as no amount of orthodontic treatment could alter the widths of the permanent teeth. I have never seen cases like Dr. Hawley's, and if he could give us a better description of them, with casts, and the actual measurements, it would be appreciated. I see Dr. Hawley's point exactly. On account of excessive widths of the lower teeth his diagnosis made it necessary to remove a lower central incisor. The patient would never have normal occlusion of all thirty-two teeth, but probably could be provided with normal occlusion of the bicuspids and molars.

Dr. V. H. Jackson, New York. I would like to make a few remarks on the President's address. First, I want to say it is on broad lines, and he has set an example for us which, I think, will go down in history.

I am very much interested in heredity. I have read Davenport's work and have gone through the scientific list, so far as possible, and I do not want the gentlemen here to think that they do not want their offspring to represent their parents. In other words, we have to consider whether we shall make heredity a dominant factor without changing the meaning of the word.

I fully appreciate the views expressed by your President.

With regard to the matter of progress in our work, our work will depend upon keeping ourselves abreast of scientific progress. We must be willing to discuss the matters before us, and present our views with all our hearts and honesty of purpose. If we work in that channel we will have one of the greatest specialties not only in dentistry, but for many years in medicine, but much will depend upon ourselves whether we take the stand that we are medical specialists. I have for many years advocated that, and in that way we should stand pretty close to the rhinologists and laryngologists, discuss these subjects with them and work with them.

Dr. Fischer. (Closing the discussion.) I do not want to detain you very long; I wish merely to express my appreciation of the many kind things that have been said this morning, and to refer to one or two points. First, the education of the orthodontist. You will all agree with me when I say that orthodontics is just as important a specialty as otology, rhinology, pathology, or any other 'ology'; and if the universities are fit to teach one they can teach all. I wish to point out that it is the function of the university, if it teaches pathology, opthalmology, or otology, to teach orthodontics. It is worthy of university recognition. That is the point I make. I think our specialty is worthy of university recognition, and I did not mean by what I said about reaching the masses that we are going to reform society all at once. I am not that much of a dreamer. We owe it to society that we should stand on both feet and demand that these schools recognize this particular field in the healing art.

You cannot send a child to a clinic and hope to get results. I have been a teacher for thirteen years, and I know what they are doing in the schools; they are doing the best they can with the funds they have. It is a question of funds. You cannot make me believe that a man cannot teach orthodontics as it ought to be taught in a university. You might as well say he cannot teach gynecology and obstetrics, yet it is being done satisfactorily. The way to promote science and art is to get them out into the open, free air. That is why I think the universities owe it to us. We ought to appeal to them to take this matter up.

As to the technical questions discussed here, I do not want to enter into them because, important as they are, the point I really tried to bring out was this: with ideal occlusion of the teeth established, with the best results you can obtain, there is still a distant variation in patients of the same age and type of oral deformity. There is a noticeable variation in the facial deformities, and we have not in the past carefully analyzed these. We are ripe for a classification of facial deformities exclusive of the occlusal defects that belong to this or that type of malocclusion. We have not analyzed them in detail. Dr. Case is the only man who has intimated that such a thing exists, though he has not been very comprehensive; and I think that with all due deference to Dr. Case.

Gentlemen, I thank you for the manner in which you have received my address.

The Technique of the Practical Application of the New Angle Appliance.

By J. Lowe Young, New York City.

Read before the American Society of Orthodontists, Chicago, July, 1913.

In August, 1910, I spent several days with the wizard of Orthodontia, Dr. Edward H. Angle, learning as best I could from him the application, the fine technique and the possibilities of these wonderful appliances which we have under discussion to-day, as he had worked them out in his mind and on plaster casts. At this time, you must understand, they had not been tried out on practical cases for sufficient length of time to determine their efficiency. I at once began to use them and from that time I have applied them to every case that has come under my care, with one exception. A twelve month subsequent to August, 1910, I had removed all other forms of appliances from my cases except the most simple retainers, and had substituted this form of appliance.

Now, after three years' experience in which I have applied them to all kinds of cases, I come before you with this essay, imperfect no doubt in many particulars, but with the hope that you may be benefited by my description of their application; for, as no two men work exactly alike, neither do they write nor describe things exactly alike. Gentlemen, I wish to say to you at the beginning in all seriousness, that, if for any reason, I were deprived of these delicate appliances I believe that I should give up the practice of orthodontia.

It is fair to assume that every orthodontist has carefully read and re-read the articles published by Dr. Edward H. Angle, in which he describes his new orthodontic appliances. The first of these articles appeared in the *Dental Cosmos* for March, 1910, under the title *"Bone Growing"*; the second, in the *Dental Cosmos* for August, 1912, under the title *"Evolution of Orthodontia—Recent Developments,"* and the third, in the *Dental Cosmos* for January, 1913, *"Further Steps in the Progress of Orthodontia."* As it would, therefore, be a waste of your time for me to quote from these articles I will try to confine myself to a description of the practical application of these appliances from my standpoint.

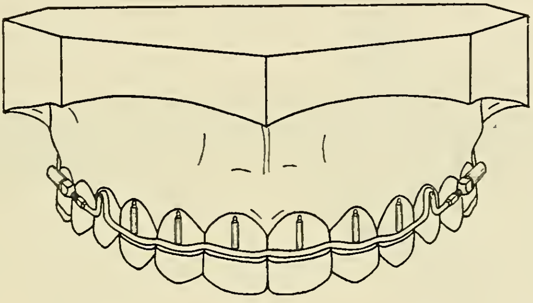


Fig. 1.

I wish to impress upon you the fact that a great step has been made in orthodontia appliances and also the necessity for accuracy in the use of these appliances in order to obtain their greatest efficiency. When we consider that the parts used in their construction are measured by thousandths of an inch it must be obvious to everyone that accuracy is of the utmost importance if we hope to be successful in their use. And here let me say that it is time we, as orthodontists, accept the micrometer as the measuring instrument in orthodontia, and lay aside the gauge which is now obsolete among all real mechanicians. I will, therefore, try to describe each step in the construction, application and adjustment of these wonderful appliances as I have used them in the treatment of practical cases.

Construction of Bands and Tubes.

In Fig. 1 you will observe bands on the six anterior teeth, with their seams on the lingual side. and so formed that the gingival border of the band passes beneath the free margin of the gum on the labial side. This necessitates that these bands be festooned on their approximal aspects. Bands so placed can be of sufficient width and yet be to the gingival of the point of contact, which is important where so many bands have to be used. I wish further to call your attention to the fact that these bands are of sufficient width so that the end of the pin that projects through the tube does not reach beyond the margin of the band, and also that the middle arch section to which these pins are soldered, rests on the band and not on the exposed enamel of the tooth. If these tubes or pins are allowed to extend beyond the margin of the bands they prevent the proper cleansing of the parts, which is a very serious objection in view of the fact that patients wearing these appliances are seldom seen more than once a month, and often at longer intervals.

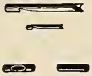


Fig. 2.

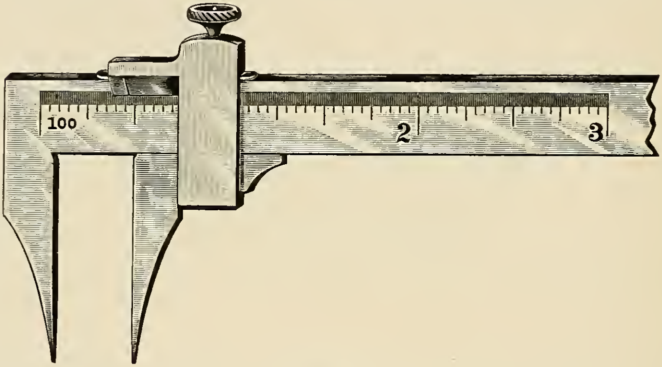


Fig. 3.

Iridio-platinum, three thousandths of an inch in thickness, and of proper width, I have found most suitable for making these bands. Before attempting to shape the band in the usual way, the side of the band material that comes in contact with the tooth is roughened by drawing it over a round cross-cut file No. 3 cut. The object of this roughening is to secure a firmer attachment for the cement so that the bands are not loosened while inserting and removing the pins.

In the beginning of a case, as shown in this figure, the band for the left central is made first and the tube (Fig. 2) is soldered to the labial surface so that it will lie over the median line of the tooth when the band is forced to place. The only exception I make to so placing the labial tubes is where the lower incisors and cuspids, and occasionally a very narrow upper lateral, need to be rotated and then the tube is placed either side of the median line, according to the requirements of the desired movement. The tube of this band, which must be accurately fitted, is used as a starting point to determine the position in which the other tubes are to be placed.

The right central band is next fitted and the position of its tube determined as follows: The fixed beak of a calipers, shown in Fig. 3, is placed in contact with the tube on the left central band, the other beak is moved to the position it is desired to place the tube, and the band marked by means of a suitable lancet, using the movable beak of the calipers as a guide. The tube is soldered directly over this mark. At first this was not an easy thing to do, but by means of the solder staple (Fig. 4), described by Dr. Angle in the *Dental Cosmos* for January, 1913, it is a most simple matter to place these tubes exactly over the scratch on the band. Where the bands and tubes are of iridio-platinum these solder staples should be made of pure gold, for it has been noted that gold solder even 22K is not suitable to join iridio-platinum parts. In this delicate work the least quantity of solder should be used and pure gold makes a union that is far more secure and which will not oxidize. It is important that these tubes should be in the proper position inciso-gingivally, according to the requirements of the case. In like manner the remaining bands are made and the tubes attached so that they will be parallel when the bands are cemented in place. Failure to have these tubes so placed is almost sure to discourage a beginner in the use of this delicate appliance.

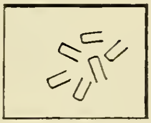


Fig. 4.

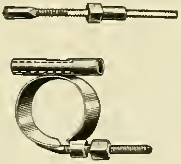


Fig. 5.

Precaution in Cementing Bands.

In cementing these bands care must be exerted to prevent any of the cement entering the labial tubes. Various methods have been used to obviate this, but the one found most successful is to stop up both ends of the tube with bees-wax before placing the cement in the band. The bands should be cemented individuallly so as to make sure that each is thoroughly cemented and accurately burnished on the lingual surface of the tooth. The cement must be allowed sufficient time to thoroughly set before attempting to insert the pin in the labial tube.

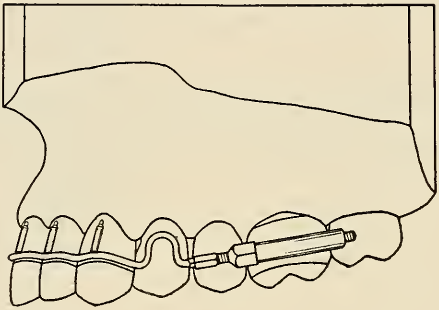


Fig. 6.

Anchor Bands.

D bands are now fitted to the teeth that are to be used as an anchorage (usually the first permanent moiars). In cases where it is found necessary that these anchor teeth should be moved buccally to any great degree it is advisable that the buccal tube of the non-rotatable variety should be used (Fig. 5). In adjusting these buccal tubes it is even more essential that they be properly placed, than where the ordinary expansion arch is used. The mesial end of the tube should be in such a relation to the band as to allow the nut on the screw section to occupy the buccal, embrasure between the anchor tooth and the tooth mesial to it, as in Fig. 6.

The direction of the tube, with very few exceptions, should be such as to cause the arch when placed in the tubes to lie very close to, if not in contact with, the buccal surfaces of the teeth mesial to the anchor tooth. The direction of the tube on each band should so harmonize that when one end of the arch is inserted into the tube that is to receive it, the other end of the arch will lie on the same plane from both a vertical and horizontal view, with the tube of the opposite side. In order to do this in the mouth a regular expansion arch should be used as described in a previous article by the writer, read before this society and published in ITEMS OF INTEREST for February, 1912.

Construction of Middle Section.

After these bands are securely cemented in place the case is ready for the construction of the appliance, which should always be done in the mouth. In doing this I would suggest that the operator develop a definite system, beginning, for example, always on the left side of the mouth. One of the screw sections of the arch is placed in the buccal tube on the left molar band and enough of the thread should be exposed between the nut and the square portion, so that the nut can be turned back to liberate the square end of the middle section of the arch, for it is obvious that when the pins which are soldered to the middle section of the arch, are telescoped into the tubes on the bands on the anterior teeth it is impossible to draw this middle section forward to remove it from the screw section.

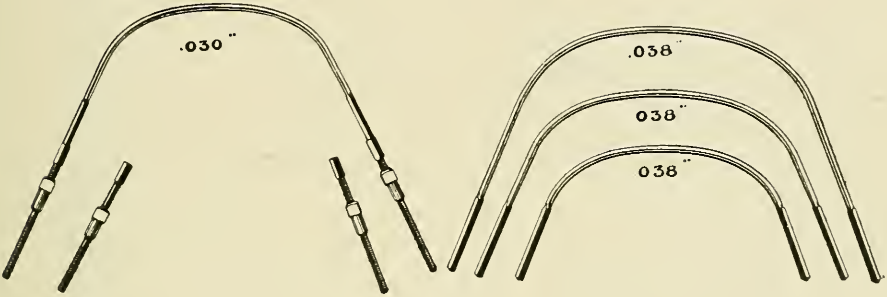


Fig. 7.

The length of this middle section should be determined as described by Dr. Angle in his article published in the *Dental Cosmos* for August, 1912, namely, by bending a piece of the heaviest brass ligature wire to the shape you wish to make the middle section, and also so that it will assume the position you desire the middle section to occupy when finished. The wire is then straightened and afterward curved to correspond in shape to the middle section of the arch. This is found to be a reliable gauge for the length of the middle section. These middle sections can be procured in three sizes, namely, .030, .038 and .045 of an inch and also in three lengths as shown in Fig. 7. They are also made in nickle, silver and precious metal. And just here I wish to say that these precious metal middle sections are made of an alloy far superior to anything I have ever used before. In fact, it seems to be ideal and to meet every requirement.

In constructing the appliance which we are considering to-day, the middle sections of precious metal .030 of an inch in diameter is always used. If possible, a middle section should be selected of sufficient length to allow all of the square portion to be cut away with the exception of enough to just telescope into the square hole in the screw section. It should also be long enough so that a loop may be bent on each side just anterior to the square portion of the arch. The reason for this will be given later. The selected middle section should be heated to a cherry red and quickly plunged into water to soften and at the same time oxidize the metal.

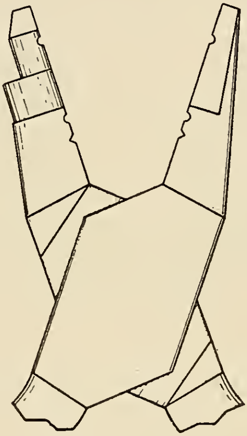


Fig. 8.

The left end of the middle section is now placed in the square socket of the screw section which has been previously placed in the buccal tube on the left side, and where the non-rotatable variety of buccal tube is used, it will frequently be found necessary to twist this middle section so that the arch will lie in its proper position on the opposite side of the mouth.

To do this and other bending necessary to construct this appliance, I have devised and had made pliers as shown in Fig. 8. Across each beak of these wire bending pliers you will notice three grooves which should be opposite each other, so that when the jaws are closed they form two round holes and one square hole. The object of these grooves is to get a more firm grasp on the wire so as to twist it and to prevent bruising it. The square end of the middle section is grasped in the grooves nearest the handle of the pliers and the round portion is grasped with another pair of pliers, using the grooves nearest the ends of the beaks. With a little practice the wire can be twisted on itself just the desired amount with practically no danger of fracturing it.

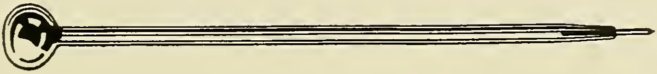


Fig. 11.

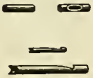


Fig. 10.

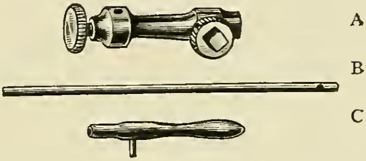


Fig. 12.

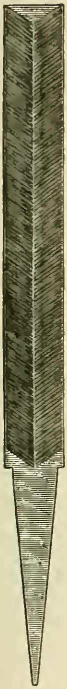


Fig. 9.

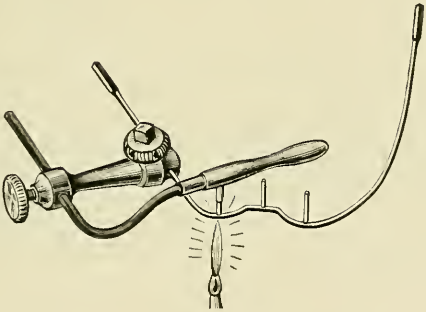


Fig. 12*a*

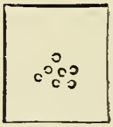


Fig. 13.

To bend the loop referred to above, the wire is grasped in the grooves nearest the ends of the beaks just in front of the square portion and bent at a right angle over the round beak of the pliers. The pliers are now turned once over, placing the round beak on the opposite side and the wire grasped, not in the groove, but on the round portion of the second step and bent so as to form a U. The pliers are turned over once more and the wire grasped in the grooves nearest the beak and again bent at right angles over the round beak as before, thus finishing the loop. The closed portion of the loop should always present toward the gingiva.

The middle section is now returned to the mouth and the left end inserted in the square socket of the screw section as far as it will go and the relation which the wire bears to the buccal surface of the teeth is carefully noted. When passive this wire should lie close to these teeth. With a suitable lancet (No. 4 S. S. White) the wire is marked opposite the distal surface of the cuspid, the middle section removed, and the wire bent so that it will conform to as much of the labial surface of the cuspid tooth as possible. The middle section is again returned to the mouth as before and with this same lancet the wire is marked in the median line of the labial tube. This scratch is readily seen when the wire has been oxidized. When I first began using this wire I found I could make it less springy by dropping it in wood alcohol after heating it, but as this removed the oxidation from the metal and made it very difficult to find this delicate mark I have entirely abandoned this method of annealing.

Methods of Soldering the Upright Pins.

After marking the wire the middle section is removed and with a fine screw-head file (Fig. 9) a delicate nick is cut in the wire to determine the point at which the pin is to be soldered. The position of this nick is determined by the scratch made on the labial surface of the wire with the lancet.

You will recall that Dr. Angle has described two distinct methods of soldering these pins to the middle section of the arch. The first one is to place the pin (Fig. 10) in a suitable pin-holder (Fig. 11) so that it is held in one hand and the middle section to which it is soldered is held in the other hand. The other method is to use a soldering jig (Figs. 12 and 12a) which I am convinced will be found far more accurate, especially for beginners. When we consider the delicate attachment of these pins which are only .022 of an inch in diameter we must be impressed that the heart beat might be sufficient to prevent the accurate soldering of them when a part is held in each hand. By means of this instrument it is possible for any painstaking operator to accurately solder these pins.

Owing to the difficulty of properly placing such delicate pieces of solder Dr. Angle devised a very ingenious method as shown in Fig. 13. I have tried to improve on this a little by having my laboratory man place these rings on the pins and slightly fuse so as to attach the ring to the pin in advance. I hope that these pins will soon be supplied with the solder so attached. I will not attempt here to describe the use of the jig, but will leave that for my clinic.

Before attempting to insert the pin in the tube that is to receive it, the tube should be freed by passing a twist drill .022 in diameter through it, for the fit of the pin is so accurate that the least particle of cement or the slightest bur on the inside of the tube will prevent the pin from entering properly. For cleaning out the tubes on the lower teeth I have found it necessary to use a drill with a very short handle, as shown in Fig. 14. Next, the incisal opening of the tubes should be reamed out with the instrument devised by Dr. Angle for this purpose (Fig. 15).

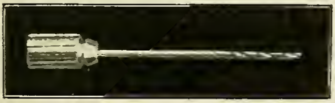


Fig. 14.

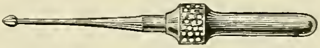


Fig. 15.

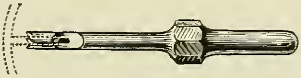


Fig. 16.

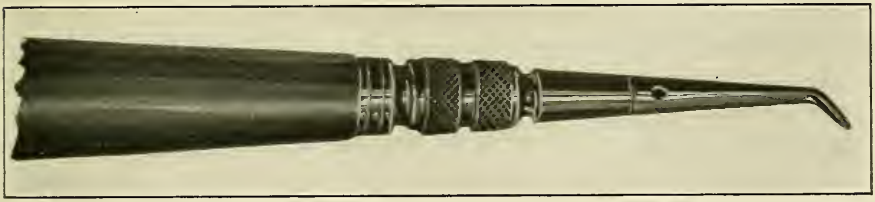


Fig. 17.

The pin is now inserted in the tube that is to receive it and if the right quantity of solder has been used it should telescope into the tube sufficiently so that the catch on the pin locks on the gingival end of the tube; if it does not do so the excess solder should be removed by means of the solder trimmer (Fig. 16) devised by Dr. Angle, so that it will lock. The nut of the screw section is turned back to allow the square end of the middle section to pass in front of the hole in the screw section. The screw section is then pulled forward with a pliers so that it telescopes over the square end of the middle section thus holding the two parts together, and the wire marked to indicate the mesial surface of the cuspid. The screw section is then pushed back to liberate the square end of the middle section, the pin unlocked by means of the band adapter (Fig. 17) and the middle section again removed. The wire is then bent so that it comes in contact with as much of the lateral incisor as possible and again returned to the mouth, the pin inserted and a mark made as before to indicate where the second pin is to be soldered. In case it is found that this pin is not on the same plane with its respective tube when the first pin is inserted in its tube, it is much better to put a twist in the base wire rather than to attempt to bend the delicate pin, which is liable to weaken it where it is soldered to the middle section. This twist is made with two pairs of pliers as previously described, except that the wire is grasped in the grooves nearest the ends of the beaks with both pliers.

The middle section is again returned to the mouth and both pins inserted so that they lock, and the relation of the square end to the opening in the screw section should be carefully noted. If not in proper position to permit the screw section to telescope over the square portion without any difficulty it should be bent so that this will be possible. In like manner the middle section should be made to conform to the labial surface of each banded tooth, bending the wire to fit but one tooth at a time, working from left to right, and reapplying it to the teeth each time a pin is soldered until all the required pins have been so placed that they will readily telescope through and lock in their respective tubes, and the middle section rest passively in position on the teeth.

The right side of the appliance is finished as described at the beginning for the left side and when done it will be found that the bends in the pins have been straightened out owing to the repeated passing and removing of them from the tubes with the metal in an annealed state. They should be rebent as nearly as possible to their original shape so that they will lock when passed through the labial tubes. The middle section is now heated to a cherry red (preferably in a closed muffle) and the appliance cooled in the air. This retempers the metal so that it is almost as springy as it was in the beginning. The oxidation is then removed and the appliance placed in the mouth.

If each step in the construction of this appliance has been carefully followed as described above it will be found that when the pins on the middle section are inserted in their respective tubes no inconvenience is experienced by the child. And this is as it should be.

The nut on the screw section should be turned up causing it to telescope over the square portion to its full extent.

Object of Loops.

The main object of the loops in front of the square portion of the middle section is to give a constant pressure over a much longer period than is possible to obtain where the middle section is left straight. They are also useful as a means of lengthening the middle section by slightly straightening them from time to time so that the screw section does not move too far forward and thus render its bearing unstable in the buccal tube. In many cases where the dental arch must be lengthened to any great degree, the use of these loops will obviate the necessity of constructing a new middle section.

Use of Appliance.

This appliance should be worn for a week without any attempt being made to induce tooth movement. In many cases the middle section can be left for months without removal and the pressure obtained by tightening the nuts on the screw section from time to time, in the event of which you will be guided as you have been when turning up the nuts on the regular expansion arch, namely, by a snug feeling of the teeth. But in the majority of cases it becomes necessary to remove this middle section in order to straighten it somewhat to bring about various tooth movements.

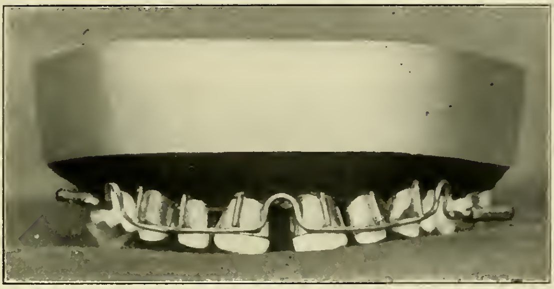


Fig. 18.

Whenever the middle section is changed in shape it is advisable to make but one alteration at each visit of the patient, keeping the remaining portion of the appliance as a control. The part that has not been changed in shape is reapplied to the teeth, the pins inserted into the tubes so that they lock, the nuts on the screw section turned up to unite it with the middle section and the relation the remainder of the appliance bears to its respective tubes should be carefully noted. To be specific on this point: at no one time should the middle section of the appliance be straightened more than would change the relation of the pin with its tube the wall thickness of the tube. In rotating teeth it becomes necessary to accentuate the bends. In doing this the middle section should be bent just sufficiently to cause the pin to lie on the labial side of the tube of the tooth to be rotated, when the base wire rests on the prominent portion of the tooth, working on but one tooth at a time. It is much safer to soften this middle section as described above before attempting to straighten the wire. If the second step of the pliers devised for this purpose is used to straighten these bends there is practically no danger of breaking the wire. In like manner the large, round step of the pliers is used when it is necessary to straighten the loop just anterior to the square portion of the middle section.

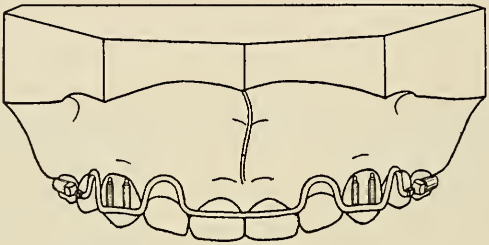


Fig. 19.

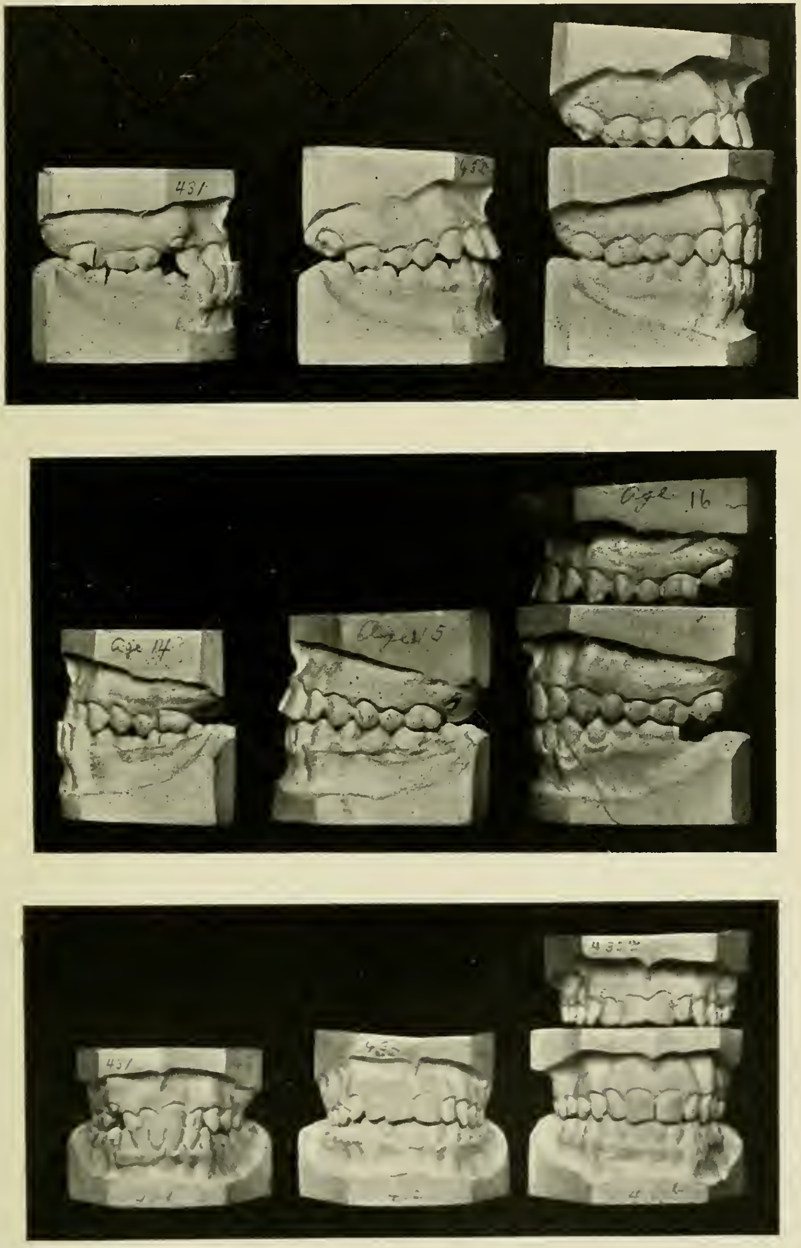
Fig. 20.

Modifications of Appliance.

In order to use this appliance on all kinds of cases it becomes necessary to modify it to meet the conditions. For example, when the roots of the central incisors converge and the crowns diverge a loop is made in the wire over the second step of the pliers midway between the points at which the pins that enter the tubes on these teeth are soldered. When a loop of this kind is used between two pins it is practical to have the labial tubes converge toward their gingival ends. The extent of this convergence on each tube should not be more than half of the outside diameter of the tube. This application is shown in Fig. 18.

Treatment of Deciduous Teeth.

In the treatment of deciduous cases the cuspid teeth only are fitted with bands to which are attached labial tubes. Owing to the conical shape of these deciduous cuspids I have found it advisable to cut nicks in the enamel on both the labial and the lingual surface to get a more firm attachment for the cement. In fact, wherever



Figs. 21, 22 and 23.

I band deciduous teeth I nick the enamel with a very small knife-edge carborundum disc and since adopting this plan I have had very little trouble with bands coming off. Fig. 19 shows how the middle section of the arch is bent between the pins that enter the tubes on the deciduous cuspids. The appliance is removed once a month and one of these loops slightly straightened out and the apparatus reapplied. As the span from cuspid to cuspid is so long, considerable difficulty was encountered with these delicate pins breaking off.. To obviate this I have placed two tubes on each cuspid band and soldered two pins to telescope into them. In this way I have practically overcome the breaking of these delicate pins. To remove these broken pins from the tubes was very troublesome until I devised an instrument shown in Fig. 20. Since then I have had no more trouble.

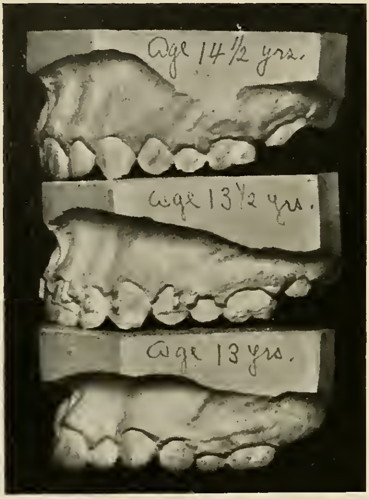


Fig. 24.

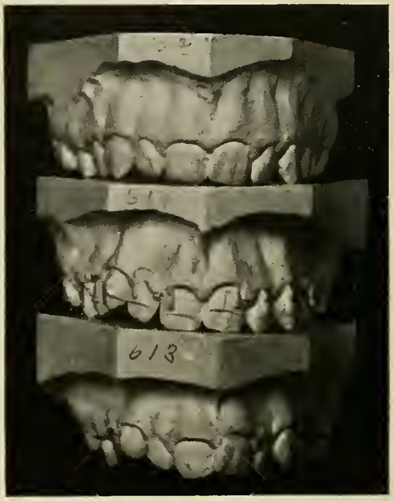


Fig. 25.

Treatment of Mixed Dentures.

In the treatment of mixed dentures we frequently have teeth erupting in torso-occlusion. Many of these will assume their proper position owing to the pressure of the tongue, which is allowed free play with this form of appliance, provided the dental arch is widened sufficiently to accommodate them. Where this does not occur I have soldered to the middle section a piece of this same spring gold .022 and bent it so as to pass lingual to the erupting tooth and press on the portion of the tooth most lingual, with very gratifying results.

In order to carry the roots lingually, as is sometimes necessary in Class III cases, the pins should be soldered so that the notch presents lingually. In all other cases the notch on the pin should present labially.

When necessary to move several front teeth laterally it is best to resolder the pins from time to time. For example, if the four incisors and one cuspid should be moved to the left, the left cuspid pin is moved to the left the wall thickness of the tube, the appliance reapplied and worn for at least two weeks. At the next sitting this same pin is resoldered, moving it the same as before. In this way all of the front teeth except the one that is being moved, act as an anchorage against this tooth. When in its proper position the next tooth is moved in a like manner and so on until all are placed as desired.

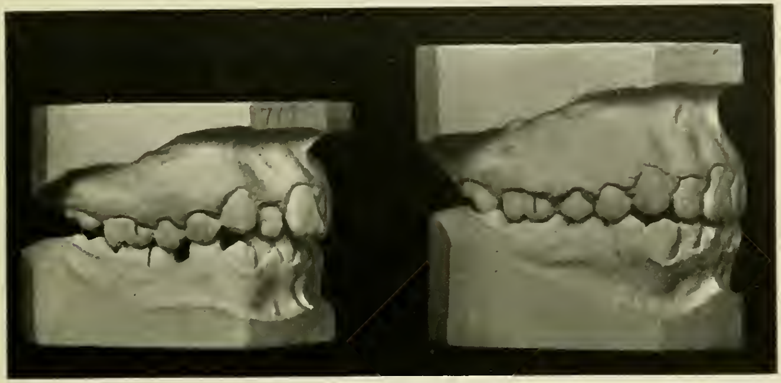


Fig. 26.

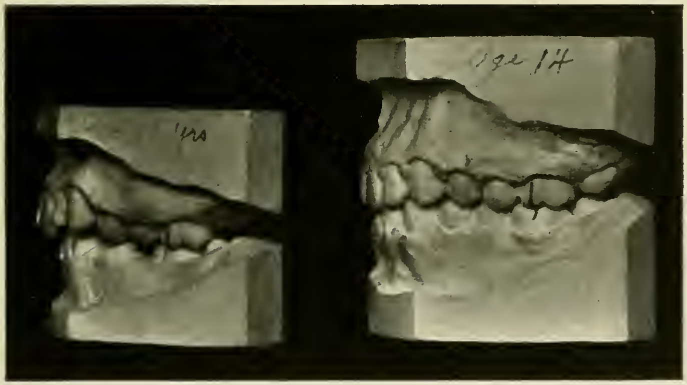


Fig. 27.

The Appliance as a Retainer.

When the teeth are in their proper positions this appliance serves as a retainer, provided it is worn in a passive state. If it is not so it should be removed and shaped so that when reapplied it will rest passively on the teeth. You will recall that Dr. Angle originated this form of appliance to act as a "working retainer"; that is, to retain the crowns of the teeth as they were and at the same time move the roots in the desired direction. Where the entire treatment has been done by means of this appliance the roots and crowns are moved in unison.

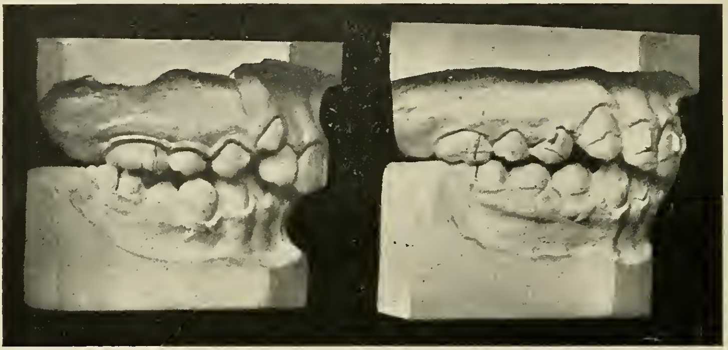


Fig. 28.

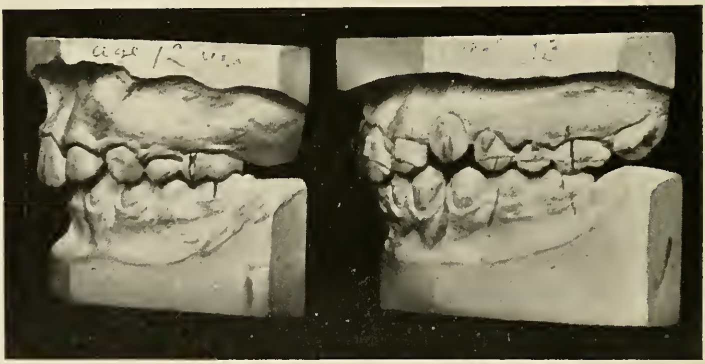


Fig. 29.

Especially do I wish to impress upon you that each beginner should thoroughly master the technique of these delicate appliances by repeated application of them to plaster casts or technique models, before attempting to place them on practical cases, and in doing this let me suggest that the bands be all securely cemented just as they would be in the mouth before the middle-section is fitted. There are many new thoughts to master, and each step must be most painstakingly and accurately executed if you would employ them efficiently.

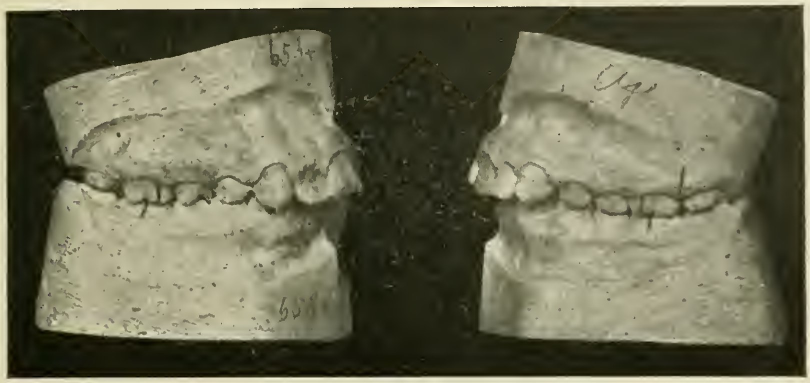


Fig. 30.

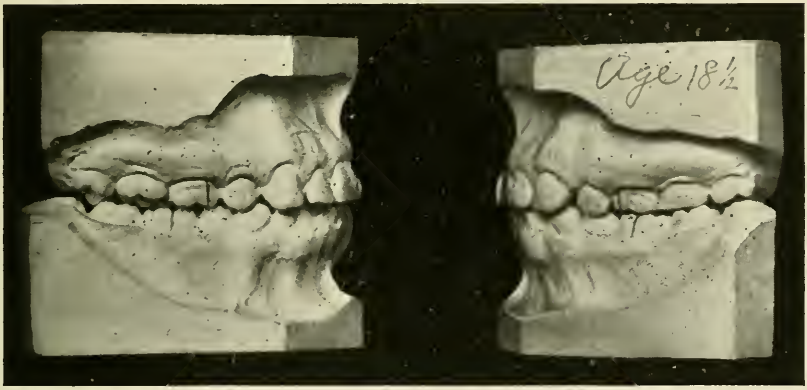


Fig. 31.

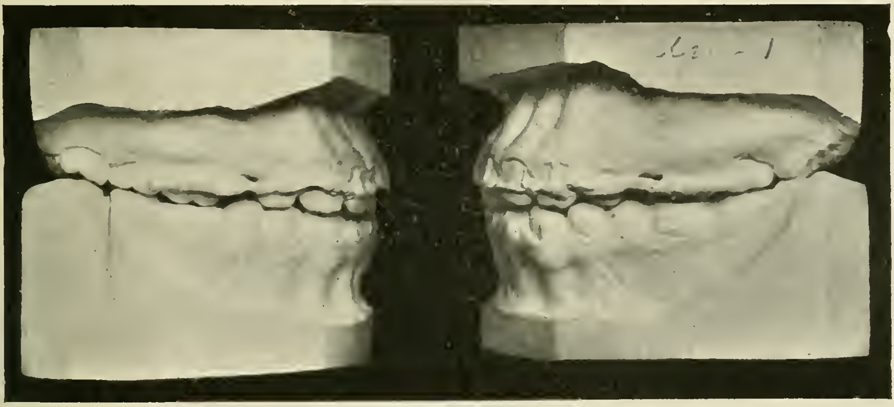


Fig. 32.

Remember that the highest kind of skill is purchased only by the most painstaking kind of work. Only by doing our work carefully and bravely can the purchase price be paid, and only by not traveling in the middle way of mechanics and thought can we know any great happiness in our work. Let the modern orthodontist learn early in his work that he must accept without whimpering a measure of sorrow in return for every moment of great advancement: it is inevitable. This lesson once learned will make his way easier and his work less bewildering.

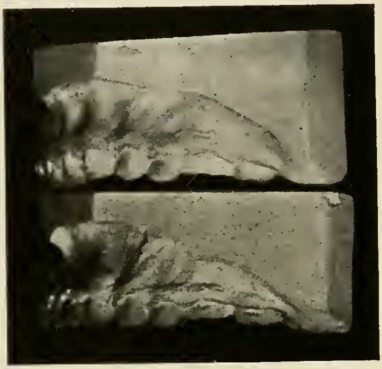


Fig. 33.

Cases from Practice.

Slides made from models of a few cases that have been treated with this form of appliance will now be shown. In all of these the models with odd numbers on them are the first to show the condition of the case at the beginning of treatment, as "431." The next models after treatment are number "432" and the next ones "432*a*," and so on. In this it will be observed that an accurate record of the progress of the case is kept by the models alone.

Fig. 21 shows the profile view of the right side of models 431, 432, 432*a* and 432*b*.

Fig. 22 shows the profile view of the left side of these same models.

Fig. 23 shows the front view of these same models.

This case was treated with the expansion arches and ligatures and when retained with the usual form of retainer was as shown in models 432. After about two years of retention, the roots of the upper teeth were found to have moved but little in response to the forces of occlusion and the retainer was removed from the upper and an impression taken and cast 432*d* was made. At this stage of the treatment, the new Angle appliance was installed and the case treated for two and a half years with the result as shown in models 432*b*.

Figs. 24 and 25 show profile and front view of casts of upper, treated from the beginning with the new Angle appliance. Please notice the increase in width over the cuspid roots in cast 614*a* over that shown in 614.

Figs. 26 and 27 are right and left profile views of a case treated by this same form of appliance. In this case the active treatment extended over one year and the appliance was left another year as a retainer. The appliances were removed with the result shown in models 718. Please note the increase in length of the dental arches without tipping the teeth. The lower appliance was reapplied, but the upper teeth were left free to see if they would remain as they now are or possibly improve under the influence of occlusion.*

Figs. 28 and 29 are made from right and left profile views of models before and after treatment, with this form of appliance. As in the preceding case, please note the increase in length of the upper dental arch and also that the incisor roots have been carried forward more than the crowns.

Figs. 30 to 33 show various models of a case in which the upper second bicuspids were extracted and the spaces closed by drawing the teeth together. When this patient came to me he was eighteen and a half years old and his teeth were as shown in Fig. 31. After careful study it was decided to restore the lost bicuspids. Fig. 32 shows how these spaces have been created, though not seen very plainly, owing to the appliance being in place. Fig. 33 shows the lower casts of this case, the upper one having been made one year previous to that underneath. The lower arch in this case was treated by means of the expansion arch and ligatures until the teeth were as shown on the upper cast in Fig. 33. The Angle appliance was then used and the roots, incisors and cuspids carried forward as shown in the lower cast Fig. 32.

Discussion of Dr. Young's Paper.

Dr. F. W. MacDonald, Detroit, Mich.

It is almost absurd for me to discuss a paper of this character since Dr. Young has given us such a detailed description of the fundamentals underlying the technique of the practical use of this new appliance. He has given us the benefit of his practical experience, and I doubt if any of us who has used this appliance can find any weakness or element of error in what he has brought before us this morning. I have always held Dr. Young in great esteem, not only for his mechanical ability, but for his fixity of purpose as well, and I wish to assure you and to assure him that my esteem has been greatly strengthened by reason of the presentation of this splendid paper.

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* Examination of this patient this autumn shows that the upper teeth have relapsed to a considerable degree and it will, therefore, be necessary to readjust appliances for him.

I have looked over the paper carefully and from the standpoint of technique simply, I cannot discover anything that I can take any exception to, or that in the light of my experience I can honestly find fault with. Perhaps this is so because in practice I have followed Dr. Angle and Dr. Young very carefully in the development of their technique.

However, there are a few matters which may be looked upon in the light of theory, which I would call your attention to at his time. One of these relates to the manner in which Dr. Young constructs his bands. I may as well say that I construct my bands exactly as he does, although when I first commenced using this appliance, I did differently. In Dr. Angle's article, published in the *Dental Cosmos,* as you are doubtless aware, we are taught that the bands on the teeth should not be carried beyond the gingivæ, excepting on the approximal surfaces. In other words, the band material should not be cut or festooned to allow the lingual and labial portions to be carried over the lingual and labial surfaces of the teeth under the gingivæ.

Theoretically I believe Dr. Angle to be right in his contention. The greatest tensile strength of the band, if it may be so characterized, is derived by having the continuity of the band uninterrupted. But when we come down to practice we have another condition to deal with, which from the prophylactic standpoint must be met. To construct the band without festooning, and then to allow the tube to extend beyond the margin of the band is simply exposing the gingival surface of the enamel of the tooth to a condition that is bound to produce an irreparable damage, especially in view of the fact that with this form of appliance treatment is not as frequent as with the old; so that from a practical standpoint we must necessarily compromise, and sacrifice some of the mechanical strength for the sake of promoting a cleaner and more sanitary condition of the surfaces we should be most careful to protect. To the orthodontist who is careful in the production of tension and who has an intelligent conception of what light tension is, there is no danger of carrying the lip or labio-gingival portion of the band away from that surface of the tooth. However, I can readily understand if a very light tension is not used, that a more dangerous and unsanitary condition might be created.

Another point I would like to call attention to and that is in connection with the soldering of the pins. I have used the pin-holder which has been suggested and I find that there is a great danger, if we are not careful, of overheating the pin. When you have the proper facilities to temper your arch and pins after the work is entirely completed the danger is not so great that it has to be reckoned with.

Aside from these points I cannot see that there is anything that I would care to say in regard to any of the points of technique Dr. Young has brought forward. I wish to say, though, before I sit down, that I consider this appliance the most efficient appliance that it is the privilege of the orthodontist to use. I firmly believe it is the only appliance for a man to use who has great ideals and who wishes to approach these ideals to any extent.

I consider it my good fortune to have entered upon the practice of orthodontia at the beginning of this new era, and my advice, especially to one entering upon the practice of this specialty, is to take the time to master the technique of this new appliance, the fundamentals of which we have had presented to us this morning, for in so doing you will broaden your field to the extent that you will achieve results you could not have attained had you not been proficient in this application.

I wish to thank Dr. Young for presenting this paper at this time. I consider it a sister classic to the one he presented to this society in Boston two years ago.

Dr. Martin Dewey, Kansas City, Mo.

It seems that Dr. Young has called attention to some statements which I made yesterday. I was very glad to hear the paper because I have never been in favor of this appliance and am opposed to it now. There is one feature which I have condemned which Dr. Young has eliminated. He has trimmed his bands so that they do not interfere with the approximal contact of the teeth. That is a decided improvement. If you can make the bands narrow enough, so that they do not interfere with the approximal contact of the teeth, you have eliminated one of the objections.

Dr. Young has made the movement of teeth a mechanical proposition. He exercises all force to a limited degree. He says he can measure to a thousandth of an inch and the appliance will move the tooth that much. The sooner we get away from the movement of teeth by figuring or measuring them by the hundredth of an inch, the better our results are going to be.

Dr. Young showed one model where he had the appliance on a deciduous arch. I suppose he put an arch there because there was no space between the deciduous teeth. He had the patient wear the appliance for a number of years and then considered the arch normal. He decided that the appliance developed the arch and that Nature did not. If he had taken the appliance off and had given Nature a chance to develop the arch, the chances are ninety in a hundred that the dental arch would have been normal when it was time for the permanent teeth to erupt.

Because you do not find spaces between the deciduous teeth at six is no proof that they will not be there at six and a half years of age. Individuals develop at different ages. A condition at the age of six may be normal for that individual, and in the next youngster at six and a half a similar condition would be normal for that age. I think we should give Nature a chance to do something in these cases.

In another case he showed models at 14, 16 and 19. If I had to work from 14 up to 19 before getting a result, I would not believe I had a very good appliance. I am convinced from my experiments on lower animals that the development of bone will take place much more rapidly than in five years. It will take place in a few weeks or months, but to get the development of bone, you must have the natural physiologic forces. Therefore, if you use such an appliance as described, you are apt to keep it on too long. You do not give Nature the chance she should have. Dr. Young has been keeping this appliance on a long time in certain cases because he was trying to make the movement of teeth and development of bone a mechanical proposition. He called our attention to the fact that in one case the patient was eighteen years of age, where he carried the anterior teeth forward bodily and said he could feel the roots, but no bone had developed between these teeth.

Dr. Young. There was not enough bone.

Dr. Dewey. With the mechanical construction of the "new appliance" you hold the teeth in one position. If you hold the teeth with the new appliance you do so in such a way that Nature cannot do anything for the development. Every time the youngster bites there should be the stress of mastication upon the teeth. There is no development around the teeth because the appliance holds the teeth so firm, that the natural forces do not fall on the structures which support the teeth. Therefore, in regulating teeth, and retaining them, your appliance must be constructed in such a way as to permit the natural forces to have a chance to do something. If you hold the teeth rigid (say five or more years), they are very little firmer than they were at first. You must give Nature a chance to do something while your retaining appliance is on. In every one of the cases there was an excessive overbite of the anterior teeth which would make retention difficult. I believe that in the bodily movement of teeth they are liable to elongate. The overbite depends on the length of the cusps. That is true in man and it is likewise true in lower animals. Take the best normal occlusion you can find and the length of the overbite of the anterior teeth is the same as the length of the cusp of the molars, the premolars and canines. Dr. Young is a fine mechanic. He has made the regulating of these teeth a mechanical proposition. Yet he says he cannot move the lower molar back beyond its normal position. You can move a tooth as far as you want to in any direction if you have the right kind of appliance and understand the principles of force. If you move it in any direction you will get development of bone in response to the regulating appliance if the appliance meets the proper force. In private practice or in clinical practice, if I retain a case more than six months, I retain it too long because the development of bone should take place in that length of time, if all the forces of occlusion are normal, and if everything is normal, there is no object in interfering with it, and there is no reason why you should retain a case more than six months.

Dr. Ottolengui. Does that apply to teeth turned in their sockets?

Dr. Dewey. A rotated tooth is harder to retain because you have to put a band on that tooth, which interferes with the approximal contact and the tooth does not get the proper stress. By avoiding the use of rigid retentions many difficulties are overcome and six months is generally long enough for a rotated tooth. This new appliance makes the movement of teeth a mechanical proposition. You can move teeth mechanically, but the trouble comes in retaining them, and when you have to retain from 14 to 19, you are not getting the proper development of bone in between the roots. The spiculæ of bone will not be laid down in the proper positions until you take the appliance off and give the forces of occlusion a chance to act.

The histologic structure of bone and the physiologic construction of it can only be studied through the microscope and with the X-ray in hundreds of cases. If your regulating appliance is made in such a way that it will correspond with the forces of occlusion there will be fewer failures in retention.

Dr. Ottolengui. I wish only to discuss the question of bands. I agree with Dr. MacDonald that in connection with this style of appliance it is advisable to have the bands festooned so that the upper margin of the band metal will pass under the gum tissue an equal distance both buccally and approximally. I think that Dr. MacDonald is also correct in stating that it would be hazardous to have the tube extend beyond the margin of the band if the enamel were left uncovered.

But I have found that this style of band is very difficult to make from a flat piece of band ribbon. I have a pair of contouring pliers designed by Dr. Calvin S. Case for making bands for cuspid teeth, and I have found that by crimping the margin of my band metal at the point where it is to reach the labial margin of the gum, the band metal, if properly festooned may have its free ends drawn between the approximal surfaces, and when pinched on the lingual side, the crimped edge of the band is drawn to very accurate contact with the labial surface.

This method of contouring and adapting a band serves another important purpose. It must be remembered that the force exerted by the pin, through the tube, is first felt by the band itself. If this band is so made that it can be stretched, or drawn away from the surface of the tooth, under the influence of stress, we surely may expect disaster. The crimping of the edge of the band, together with the stiffening of the band by soldering the ends at the lingual side, plus the stiffness received from the presence of the tube on the buccal surface, should provide us with an almost rigid atachment to the tooth.

Dr. Carl B. Case, Milwaukee.

Until I saw the final models shown by Dr. Young, I was strongly inclined to take the view that this appliance was a very inefficient one and I was fully prepared to say so, but I must acknowledge, gentlemen, that the results which I have seen were quite a revelation to me, because I did not believe one could accomplish anything of that kind with such an appliance. But even now, in the face of the evidence offered, I cannot recognize its efficiency. In the first place, because of the extreme accuracy required in assembling it; in the second place, because of the skill required to fit it perfectly or accurately to the teeth; and in the third place, because of the extreme difficulty of adjusting or operating it, to say nothing of the skill and care demanded.

From first to last, the apparatus is the most difficult one to manipulate, which I have ever seen. The inclination and paralleling of the pin-tubes on the anterior bands, the similar inclination and paralleling of the pins on the power or spring bow; the insertion of the pins into their respective tubes simultaneously or nearly so; and last, but by no means least, the removal of the bow and its pins from their tubes for readjustment to increase the spring tension and the reinsertion of the bow with its pins into their respective tubes are obstacles sufficient to render the apparatus inefficient, regardless of the results which it may be capable of accomplishing.

Who can estimate the amount of spring force required to move teeth bodily and who can readily control that force? In the instance of causing one or more of the teeth to become intensely sore or lame think of the skill and time required to readjust the apparatus so that the one tooth will be relieved of the pressure without impairing the utility of the appliance.

What would Dr. Young do in such an instance which should be of common occurrence?

One other thing in connection with the working of the apparatus I should like explained; it has seemed to me that the movement of the central incisors must be greater than that of the other teeth on account of the greater length of spring leverage.

Dr. Young. I would like to answer Dr. Case now for fear I might forget what he has said. I spoke of carrying the four incisors forward. By putting a bend in the base wire you would bring the roots of the central incisors forward faster than the laterals. But that is not all I do. In order to bring the lateral roots out as fast as I bring the centrals, I catch the base wire with two pairs of wire-bending pliers and bend the wire, so that I can bring the lateral roots out as fast as the centrals.

I would like as many of you as possible to attend my clinic to-morrow, as that will answer most of the questions better than I can answer them here

Dr. Case. Three years ago this apparatus, I believe, was introduced under the title of "Bone Growing," and that was practically the first general recognition of the bodily movement of teeth, although bodily movement of teeth was accomplished successfully with an apparatus in 1892. This was practically twenty-two years ago. I am not going to describe or demonstrate this appliance to you. You may have seen it.

Dr. Young. I have made it.

Dr. Case. In the original models (showing casts) these teeth are seen to be so irregular that all were placed in line before that apparatus was put on. You do the same thing with the spring arch before you put your appliance on?

Dr. Young. I put the appliance on in the beginning of the treatment.

Dr. Case. There are some cases in which we find it necessary to use an aligning appliance where the teeth are decidedly irregular and it is necessary to put them into line.

Dr. Young. I know it.

Dr. Case. This contour apparatus (exhibiting apparatus and casts) is the original one used on this particular case in 1895. It shows how the alveolar ridge has been decreased in size. The accompanying cast shows the position of the teeth when the retainer was originally put on.

I pass that around to show the original contour appliance which was introduced for the bodily movement of the anterior teeth twenty years ago. This one (exhibiting second appliance) is of more recent date. Probably during the last three or four years, the appliance has been perfected. You may say that the appliance is considerably heavier than yours. You may say it would cause considerable inconvenience to a patient, but as a matter of fact it does not. There is no part of this appliance which is rough, and no matter what my patients may think in the beginning, they have told me they suffer very little inconvenience from that appliance after they had it on for a couple of weeks, or not any more inconvenience than would result from any other apparatus. It is also a decided improvement over the original apparatus that was used.

I want to speak of the superiority of this appliance, which is operated by screw force, over Dr. Young's or Dr. Angle's. The fact that you have to depend upon spring force does not permit of the generally recognized required period of rest.

Dr. Young. What do you mean by that?

Dr. Case. It has been recognized that, as a rule, the apparatus should be tightened once or twice a week, producing just a sufficient amount of force upon the teeth to cause movement and then a prolonged period of rest of three to seven days for the tissues to recuperate. You do not get continuous cell activity all the time. Therefore, you are not as apt to get inflammation of the tissue.

Dr. Ottolengui. That is not a generally recognized fact.

Dr. Case. I believe it is.

Dr. Ottolengui. I do not.

Dr. Case. There is one other thing I want to speak of, and that is the distal and mesial movement of buccal teeth. The distal or mesial movement of buccal teeth can be accomplished just as readily with the proper kind of apparatus as can be the movement of anterior teeth. That was not recognized until a few years ago. Dr. Young has denied the distal movement of molars.

Dr. Young. Under certain conditions. To make myself clear, I am willing to admit that molar teeth may drift forward mesially of their normal position. If they are forward of their normal position, I believe that they can be carried bodily distally. On the other hand, if they are not forward of their normal position in the skull, I do not believe they can be carried bodily distally, but they can always be carried mesially.

Dr. Case. One other point, and that is in regard to the working retainer. That working retainer was used for the purpose of holding the roots of the teeth bodily forward by the exertion of spring force. It later was given greater scope and moved the teeth bodily. The appliance was originated for the same purpose that my retaining apparatus was originated, *i. e.,* for the purpose of retaining the teeth bodily. But yours operates by exerting force, while mine operates by resisting the reactive forces. When it has a solid grasp on the tooth it is held firm. The relation of one tooth to another in a firm position cannot be changed and the bodily movement is maintained. There is no force at all being applied to the teeth except that which is intended to hold the teeth in position, which it does.

Dr. C. A. Hawley, Washington, D. C. I want to call attention to the great accuracy which Dr. Young has developed in constructing these new appliances and as I listened to his paper, I wondered at the accuracy of his technic. Usually, it is the tendency of the human mind to depart from the strict teaching received and attempt to find something better, something original, but I would advise in commencing the use of this appliance, to adhere closely to the technic given.

In regard to the question of incisal bands; while there is a difference of opinion as to whether it should reach the gingival line in the incisal region or whether it should be pinched from the under side and not reach it, in either case these teeth are kept immeasurably cleaner than they are under the ordinary arch. In some cases where there are deep festoons and the bands do not reach the gingival line, after this appliance is adjusted, they are so firm and there is so little danger of loosening that the patient will keep them clean and there is less danger of injury to the soft tissue than with the ordinary expansion arch.

I have adjusted a large number of these appliances in the last four or five months. Some of these cases, eight or ten of them, were cases of young children for whom I am beginning treatment. As an instance of their advantage, I might mention a little boy nine years of age. He is typical of a class that many of us have. A perfectly healthy boy, and one that has been raised with the idea that almost anything that is done to him that makes him uncomfortable, is fundamentally wrong. If you scold him very much you are apt to have trouble. I had my assistant stand by the chair, ready to check every movement, in order to keep the boy in it. He was a good-natured boy. After tormenting me to death so that I came near throwing him out of the window, he would get up from the chair, make the politest bow and say, "Good-bye, Doctor."

(Laughter.) But after I got this appliance on, I never had any more satisfaction in my life than to see him come back once every two or three weeks with everything in position. If I had used ligatures in his case, he doubtless would have returned each time with most of them untied and if he could possibly have worked the appliance loose, he would have done that. I began to make a certain movement by a bend in the arch and when the boy would come back at the end of the time specified, I would get that movement accurately. My success in such cases from the use of this appliance has been very gratifying.

There is a point that Dr. Young mentioned that I would like to emphasize. You can move teeth just as fast or faster than with ligatures and the ordinary expansion arch, but that is not the point. You can move them as fast as you want to and do not need go any faster. You do not need to go faster than you ought to go. It is under absolute control.

I would also emphasize the point and impress upon you the importance of what the author of this paper has said with regard to paying attention to details. The work he has described is very fine work indeed. I do not think we have ever adjusted an appliance that required as delicate work as this does.

In regard to some of the points referred to by Dr. Dewey, I cannot resist the temptation of discussing them briefly. He speaks of the normal development of a child's denture, and tells us that we interfere too much, and that if we leave it alone we will have normal development. Gentlemen, I have watched cases for a good many years, and I have models of children's mouths that have come back to me at two, three and four year intervals. I have watched carefully for Nature to do something, without interference and I must say that I am discouraged. I do not see how we are going to get movement of teeth unless we get it mechanically, and the more accurate that mechanical work is, the better.

I would not want to take Dr. Dewey's statement in regard to this matter unless he has models of children's mouths to show me that they have moved in the normal way after intervals of three or four years. I have not seen such models.

I have not seen a normal development of a child's denture under the present conditions of living. I have seen a good many that have no such development and I do not want to accept a mere statement that there is such development, until I see the models.

Dr. Ottolengui. You mean to say that there is no such normal development?

Dr. Hawley. Not by any means, but in the ordinary child we do not see it. There may be some such children, but I have not observed them in my practice. If there is an appliance by which Dr. Dewey can treat teeth, retain them for six months and then take off the appliance and have the teeth stay in position, it is something he has kept quiet and has not said anything to us about, because our experience is that once treated, the teeth will not stay in place without longer retention. There is not the rigidity about this new appliance that Dr. Dewey seems to think there is. The bands are not in rigid connection. The teeth are held with a tube and pin and some movement of the teeth is permitted. There is some natural movement that will prevent the bands from becoming loose. They are not so apt to become uncemented as you think because they are not collectively rigidly held.

Dr. Young has stated the difficulties of the appliance better than I can and more accurately. The main thing that I wish to speak of is the matter of experience with this appliance in my hands. I have obtained very gratifying results with it and can see a promise of great relief from many of the anxieties of my former work.

Dr. B. E. Lischer, St. Louis. While Dr. Young was reading his paper I interrupted him by asking the question: How would you treat a tooth that has only partially erupted? and he replied he would leave it alone until it was long enough. Now, I wish here to recall the distinction Körbitz, of Berlin, makes when he says that a tooth may be absolutely too short, or, relatively too short. In other words, a tooth that has only partially erupted is absolutely too short; a tooth that has fully erupted and is still too short because it fails to come into occlusion is said to be relatively too short. I think it a fine distinction and I would now like to ask Dr. Young how one can elongate upper lateral incisors that are relatively too short, with this new appliance.

Dr. Martin Dewey. I want to make an explanation as there was some misinterpretation of what I previously said. I said it is never necessary to retain a case more than six months, if you have the normal forces of occlusion operating. But if you do not have the forces of occlusion operating you might have to retain the teeth for a lifetime. That is my proposition.

Dr. Federspiel. It is a question of whether deformity is secondary or primary, and if you remove the primary cause early enough, the secondary condition is not fixed, and I am satisfied the child will go on developing normally. If the secondary condition becomes fixed and the primary cause is not removed, that is another question.

Dr. Hawley. I would like to ask Dr. Dewey what he means by the forces of normal occlusion. Does he mean that in case you see a perfectly corrected malocclusion, the teeth must be in absolutely correct occlusion, with the buccal cusps in absolute contact. Ideally we may correct a case with that condition in view, but practically there have been very few cases shown where we have absolutely ideal occlusion.

Dr. Ottolengui. I would like to ask Dr. Dewey a question. I am very much in accord with his views, but it is not clear to me what he just said. If you fail to obtain the normal force of occlusion, you have to retain the teeth a lifetime. Did he not mean until we do get the normal forces of occlusion?

Dr. Dewey. If the normal forces of occlusion are not established we must retain the teeth a lifetime or until they are established.

Dr. Ottolengui. That applies to almost any case. I have been getting satisfactory results in the last two or three years by removing my retention from one jaw first, allowing that to be unrestrained, while the other was retained, and then after the bone growth and gradual fixation of the teeth of that particular jaw, it will be safer to remove the retention from the other.

Dr. Elscher. Regarding the point relative to the length of time required to secure permanent maintenance of the newly established relations, Körbitz recommends removal of the post-treatment appliances in parts, and that the lower incisors and cuspids be held longer than other parts of either arch. He maintains that they are a powerful factor in shaping the form of the entire denture and I quite agree with him.

Dr. Young. I am very much pleased with the discussion on my paper. I said in the beginning, I believe in short papers, because in that way one is more likely to get his paper discussed, and I dislike to read a paper and not have it discussed. In this instance I have written a long paper and there has been a splendid discussion of it.

I am going to try to answer each man in the order in which he discussed the paper. The first one is Dr. MacDonald. Just a word on that little pin-holder and the fault he finds with it. These pin-holders are so made that the pin will go in too far. If you will pinch the two sides together so that when you force the head of the pin in that it is held firm, you then have 15/100 of an inch of that delicate 22/1000 wire between the end of the pin-holder and the point where you are to solder. This prevents the pin-holder from getting hot.

I believe that we should strive to construct appliances so as to exert a constant delicate force, not an intermittent force. And just in proportion as we are able to do this will we be able to move teeth in the most physiological manner. That is why I have advocated to Dr. Angle that a loop should be bent on each side of the middle section of the arch just in front of the square portion that telescopes into the screw section. I do not claim that by means of these loops I get a constant, uniform pressure for a long period, but I do believe that the pressure continues over a much longer period than where the middle section of the arch is left without loops. If we can construct an appliance so that the pressure exerted on all bands attached to the teeth will be constant and uniform for the entire period of active treatment, then I would say it was ideal. We have not such an appliance, nor do I think it possible to construct one.

Dr. Case. I would like to ask what you would do in a case in which you are causing inflammation or soreness of any of the incisor teeth you are moving with that spring force?

Dr. Young. If you have inflammation or soreness it is because you have used too much force.

Dr. Case. How do you know what force you are exerting?

Dr. Young. My judgment would tell me. I am not advocating the elimination of screw force. I do not believe we will ever eliminate screw force in the movement of teeth; but I say, if we could eliminate it we would be better off.

Dr. Lischer spoke of the elongation of teeth. With this appliance it is the most simple thing to elongate individual teeth. For example, where the laterals are in infra-occlusion as we frequently see them in the upper arch. The middle section of the arch should be so bent that when the pins are soldered to it and the appliance placed in the mouth the pins that enter the tubes on the central incisors and cuspids will pass through so that they lock and those entering the lateral tubes fail to lock. With a suitable instrument the arch wire is sprung upward so that the lateral pins lock one at a time and as there is no slipping the laterals must elongate, owing to the constant pressure exerted.

If you recall, at the meeting in Washington, Dr. Watson gave us a paper in which he spoke of a cuspid to cuspid retainer and leaving it on the last thing.

I have been using these cuspid to cuspid retainers on the lower teeth ever since Watson gave that paper and it is usually the last part of the retaining device to be removed. The objection to this form of retainer is that two teeth are firmly bound together. If we could get some way of retaining this part of the lower dental arch, the normal width without interfering with the normal mobility of the cuspids, we would get a more physiological development of bone in this region.

Dr. Ottolengui spoke of contouring pliers for forming bands. I have used these pliers. You can use them on band material for making bands for the cuspids, laterals, centrals, or lower incisors. I use them all the time. I am glad he brought up this point because by pinching the band material with these pliers you have crimped the edge a little bit and put the metal in shape so that the band is very much more rigid when made than if you pinched the band with the metal flat.

Dr. Case has devised some ingenious pliers. I have a full set of them.

Dr. Hawley spoke about pinching bands on the lingual side, leaving the impression that if the bands were pinched on the lingual side they could not reach the gingival line on the labial side. That is not so.

Dr. Hawley. Generally you do. They can be so left, and Dr. Angle's instruction was to do that; to pinch them on the lingual side and leave them free from the gingival border of the labial side.

Dr. Young. There are some cases where it is not necessary to put them up to the gingival line. The farther we get away from the gingival border of the gum with our appliances the better off we are. That is why I think so much of this appliance. We have no ligatures to cause irritation of the gum tissues.

In regard to the remarks of Dr. Dewey about the mechanical movement of teeth, all orthodontic appliances we use are mechanical movers of teeth. I believe that no man has ever lived who can put an appliance in the human mouth and move teeth exactly as Nature will move them. We must do the best we can with our present knowledge. We may know more about it later on, but we must move teeth mechanically if we move them at all.

In regard to the lack of spaces between the deciduous teeth, Dr. Dewey said that ninety per cent. of these deciduous dental arches would develop normally without mechanical stimulation. In answer to this statement I wish to ask one question and let him and every man answer for himself. If in ninety per cent. of these deciduous cases, this normal development takes place, why is it that ninety per cent. of the people in this room have a crowded condition of their lower incisors?

It does not happen in ninety per cent. of all deciduous cases and I doubt if it takes place in two per cent. of the cases of children that live in a civilized way.

The case that was treated from 14 to 19 was first treated by means of the expansion arch and ligatures and the crowns of the teeth put in proper position and then retained with the hope that Nature and the forces of occlusion would stimulate bone development, but instead of this happening the teeth settled back. It was subsequently treated by means of the appliance we have under discussion to-day with the result shown, and I am not ashamed that I took so long with the case. I find that bone develops much more slowly in some cases than in others and I always try to gauge the tooth movement by the way the surrounding tissues develop.

Dr. Dewey thinks that with this form of appliance the teeth are held in a fixed position. That is not so. The teeth are free. I told you in my paper that in carrying the teeth forward, they would go on and rotate beyond the normal if you did not make some provision to prevent it. There is not a fixed thing in the whole appliance. Every tooth has some movement. On the other hand, I will admit they have not the same latitude of movement and chance for normal bone development as if there was no appliance on them.

As to the matter of holding the teeth too long. In the case of the boy whom I treated two years (Figs. 26 and 27 of my paper), I was much dissatisfied with the bands on his upper teeth. He was going away for the summer, and I took everything off of his upper teeth. I did it with the distinct understanding that I might in the autumn reapply this appliance. I did not take the appliance off the lower. If Nature takes care of these upper teeth I will be much pleased. These teeth have relapsed some.

I do not think it is possible with any mechanical appliance to put every tooth where it ought to be. Nature has the final say, no matter how accurately we work.

Dr. Dewey makes the statement that it is never necessary to retain a case more than six months if the normal forces of occlusion are operating, but he fails to tell us how to cause this result to be obtained.

In this connection I wish to show some slides of a case that seems to prove to me, at least, that there is a pernicious tendency for certain teeth to relapse to their former position.

Fig. 34 shows models of the teeth of a child ten and a half years old before any treatment was begun.

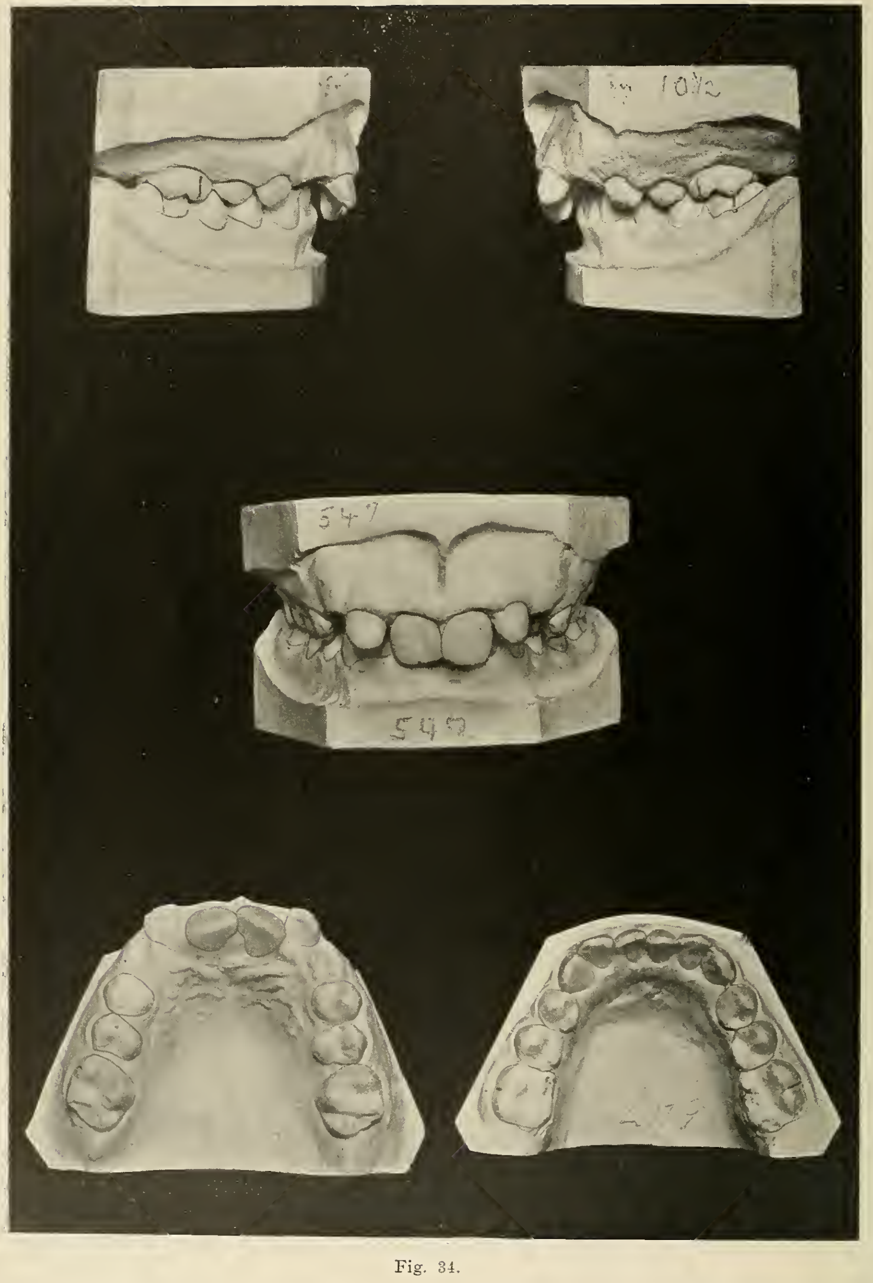


Fig. 34.

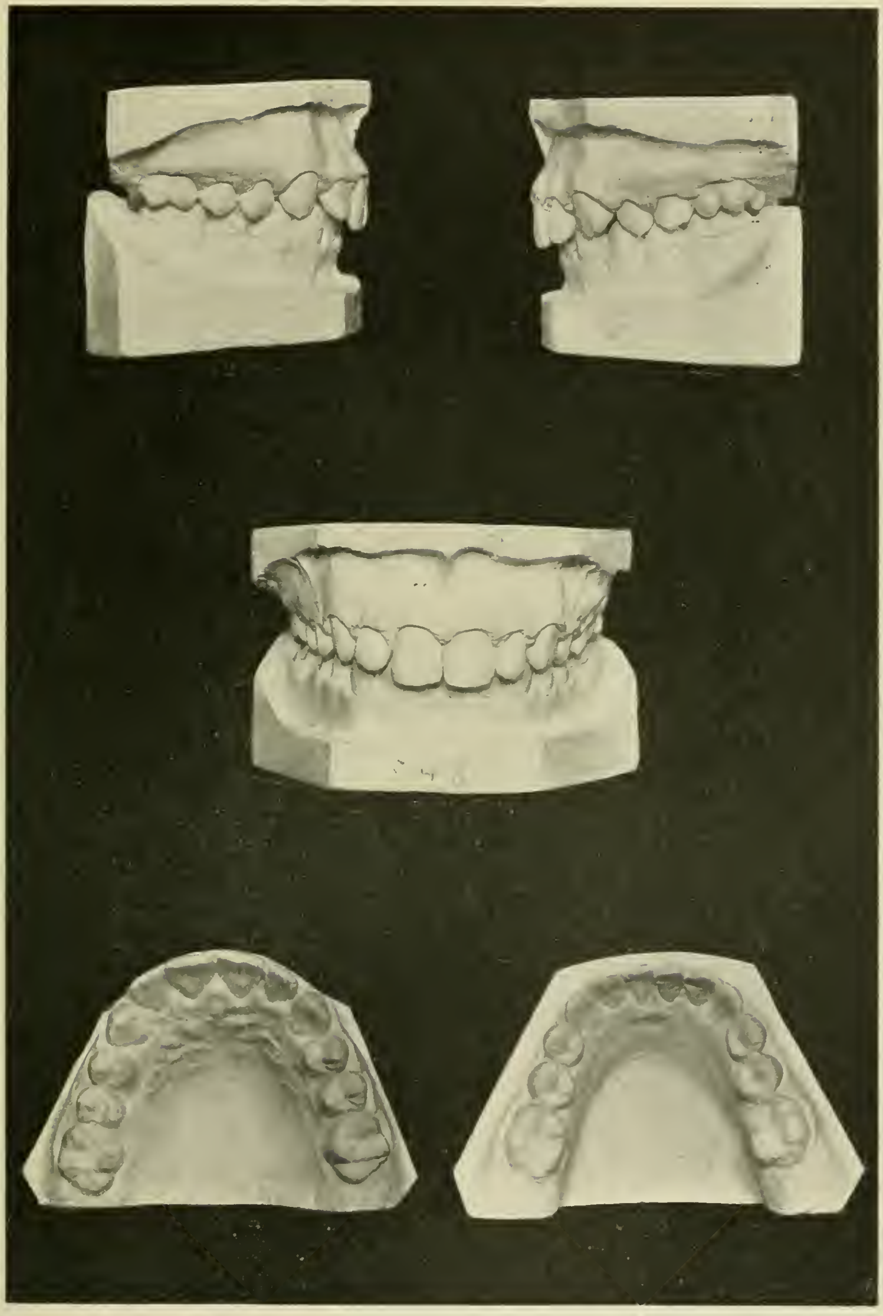


Fig. 35.

Fig. 35 is like view one year later when retention was applied. The upper retainer consisted of a bite plane attached to bands on the upper central incisors with a wire extending back from it into tubes on the lingual surface of the upper molar bands. This retainer was worn for two years. The lower was retained with the lingual arch running from molar to molar in addition to a wire fastened to bands on the lower cuspids. This lower retainer was worn for two and a half years, and during this six months that the upper retainer was removed previous to the removal of the lower, there was no tendency of the upper central incisors to relapse. It was then considered safe to remove the lower retainer and three months later models were made and the result is shown in Figs. 36 and 37. In these, you will observe, that the right upper central has moved lingually sufficient to carry the right lower

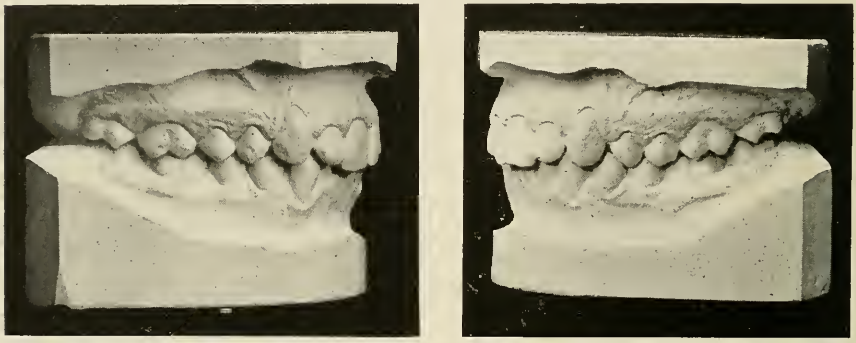


Fig. 36.

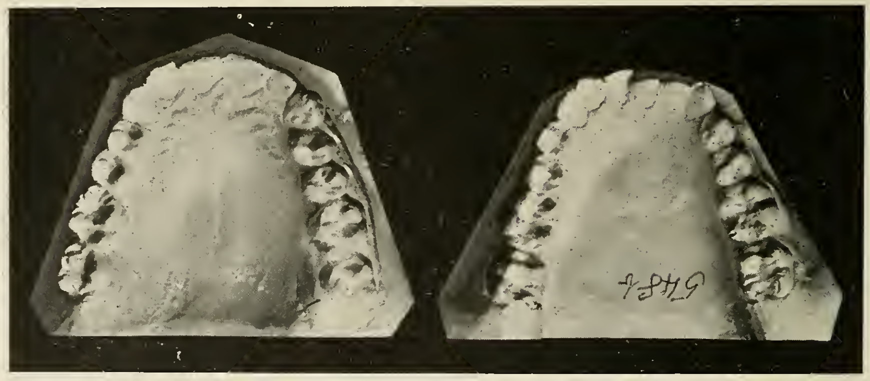


Fig. 37.

central and lateral lingually and thus force these teeth more out of alignment than they were originally, as shown in Fig. 34. Now, will Dr. Dewey tell us what we must do to overcome such tooth movement as I have shown in this case? I presume, of course, he will say that the bite plane fastened to bands on the upper centrals held these teeth so rigidly that bone development was impossible. I have another case similar to this as far as the position of the upper centrals is concerned, but which was Class I and was retained without any atachment whatever to the upper centrals, and after two years, the upper retainer was removed and the right central has drifted lingually sufficient to cause soreness of the lower incisors. These lower teeth, however, cannot drift lingually, owing to the retaining device still being in place.

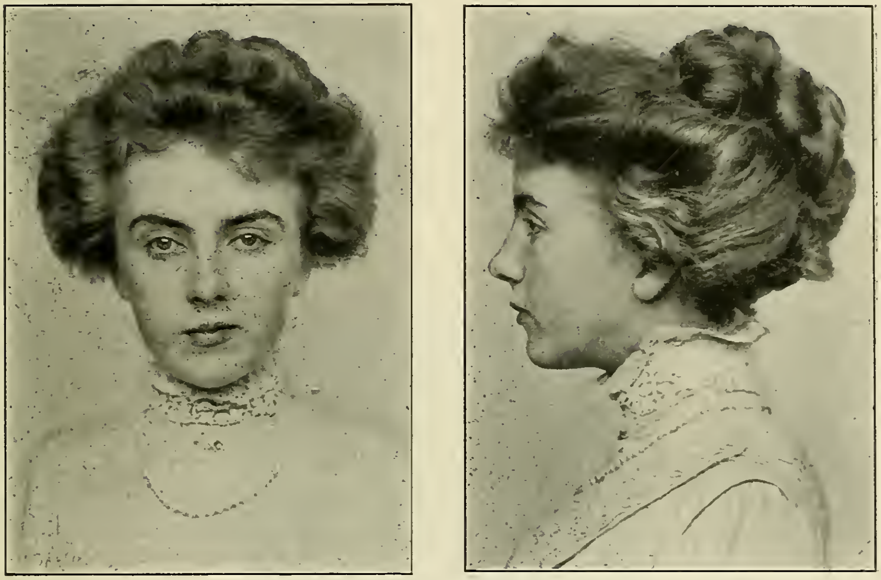


Fig. 38.

Dr. Dewey further states that teeth can be moved in any direction and new bone will form around them if proper force is applied. In reference to this I wish to show a number of slides of a case in which I absolutely failed to move teeth as I wished to do.

Fig. 38 shows profile and front view of the face of a young woman eighteen years of age.

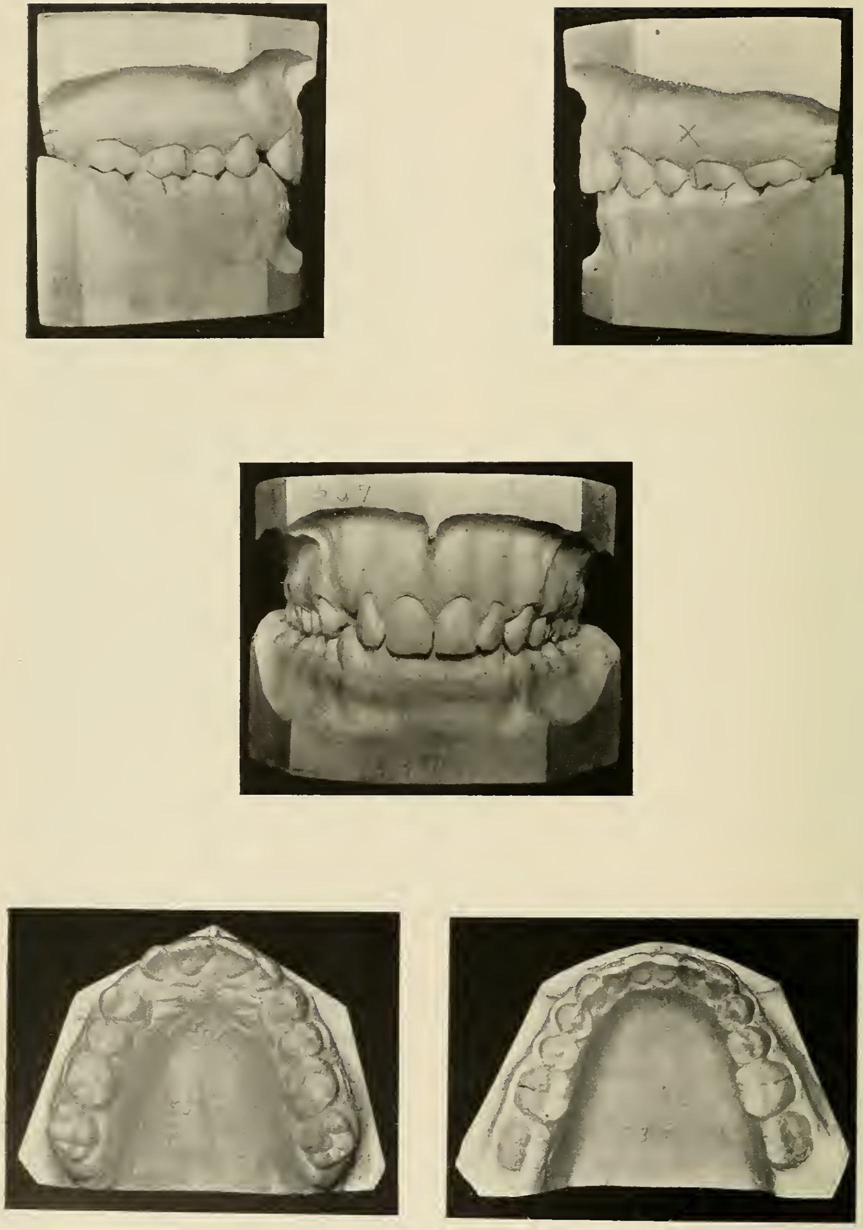


Fig. 39

Fig. 39 shows profile, front and occlusal views of models of this case at the beginning of treatment. My diagnosis of this case was that the molars and bicuspids on the right side had drifted forward and that the molars on the left side had also drifted forward and I decided to move these teeth back and thus prove that Dr. Angle was wrong when he contended that the first permanent molars never drifted too far forward. I, therefore, started in by applying force to the upper second molars using the entire lower dental arch as anchorage to force these two teeth back with intermaxillary rubbers. After several months' treatment of this kind in which the second molars were tipped distally, the appliance was changed so as to apply the force on the first permanent molars and the treatment continued as before. These teeth, however, owing to their better occlusion were found to tip much less than did the second molars, but they would not move distally. The occipital anchorage was then resorted to with the hope of moving these molars as desired, but even with this application of force at night with the intermaxillary rubbers in the daytime, it was found impossible to move the molars bodily back. I then concluded that the unerupted upper third molars were responsible for my failure to move these teeth distally so had X-ray pictures taken as shown in Fig. 40; in these you will observe that there are no third molars present.

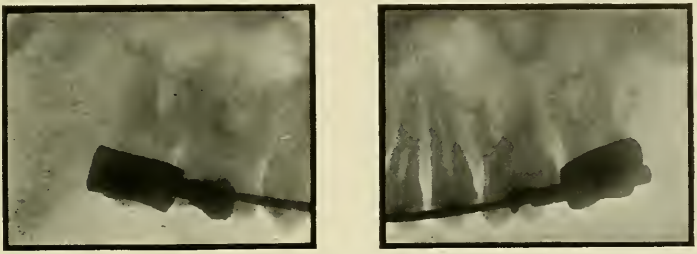


Fig. 40.

About this time Dr. Angle came to my office and I showed him the photographs and models of the case, and his diagnosis was that the upper front teeth should be carried forward so as to make room for the unerupted cuspid on the right side and to provide a space for a second bicuspid on the left side, where the X-ray shows the tooth congenitally absent and then treat as a Class II case. This I proceeded to do, dis-

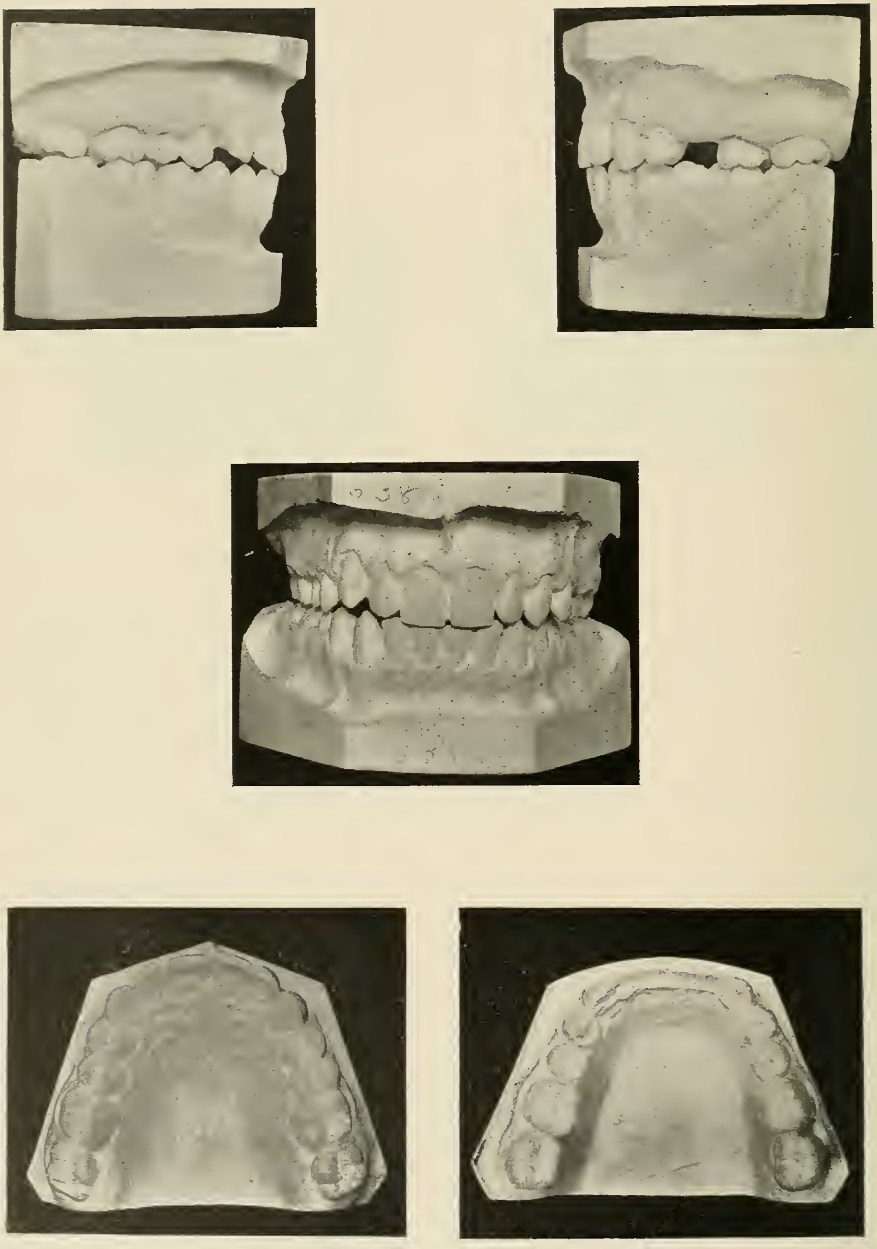


Fig. 41.

pensing with the occipital anchorage and intermaxillary rubbers and after three months' treatment the case presented as shown in Fig. 41.

Fig. 42 shows profile and front view of the face at this time and Fig. 43 shows the occlusion of the teeth a year and a half after Fig. 41 was made, and Fig. 44 the profile and front view of the face. The mandible moved forward of itself when the upper arch was enlarged sufficiently to accommodate the lower one so that the molar teeth could occlude normally and the lower teeth were never retained in this mesial position.

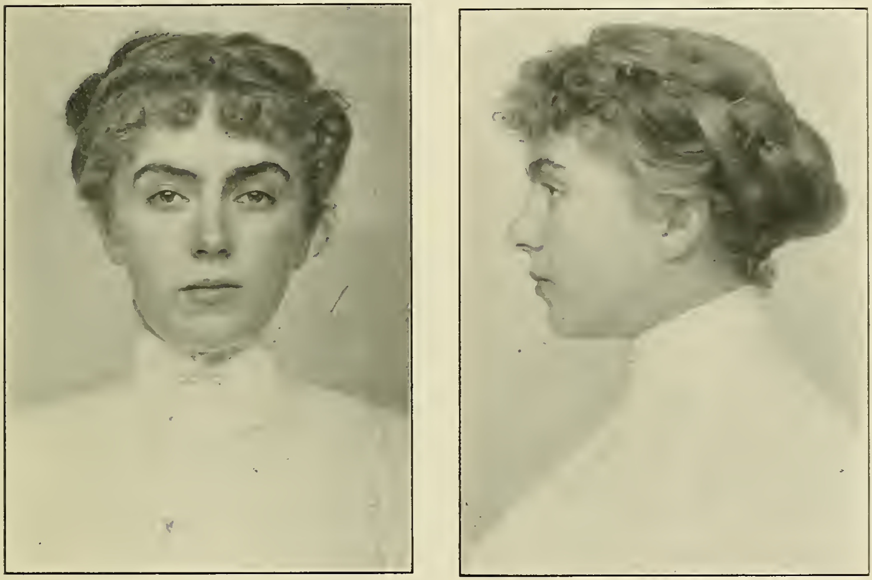


Fig. 42.

Now, I do not claim that it is never possible to move molar teeth distally, but I am of the opinion that if these teeth are in their normal position that the best we can do is to tip them and not move them bodily distally. I am convinced that where the buccal teeth have drifted mesially that it is quite easy to move them bodily distally as shown in Figs. 28 and 29 of my paper. You will observe, if you study these pictures, that the lower molars were distal to normal in relation to the upper ones, or, to be more correct, we should say that the upper molars were mesial to

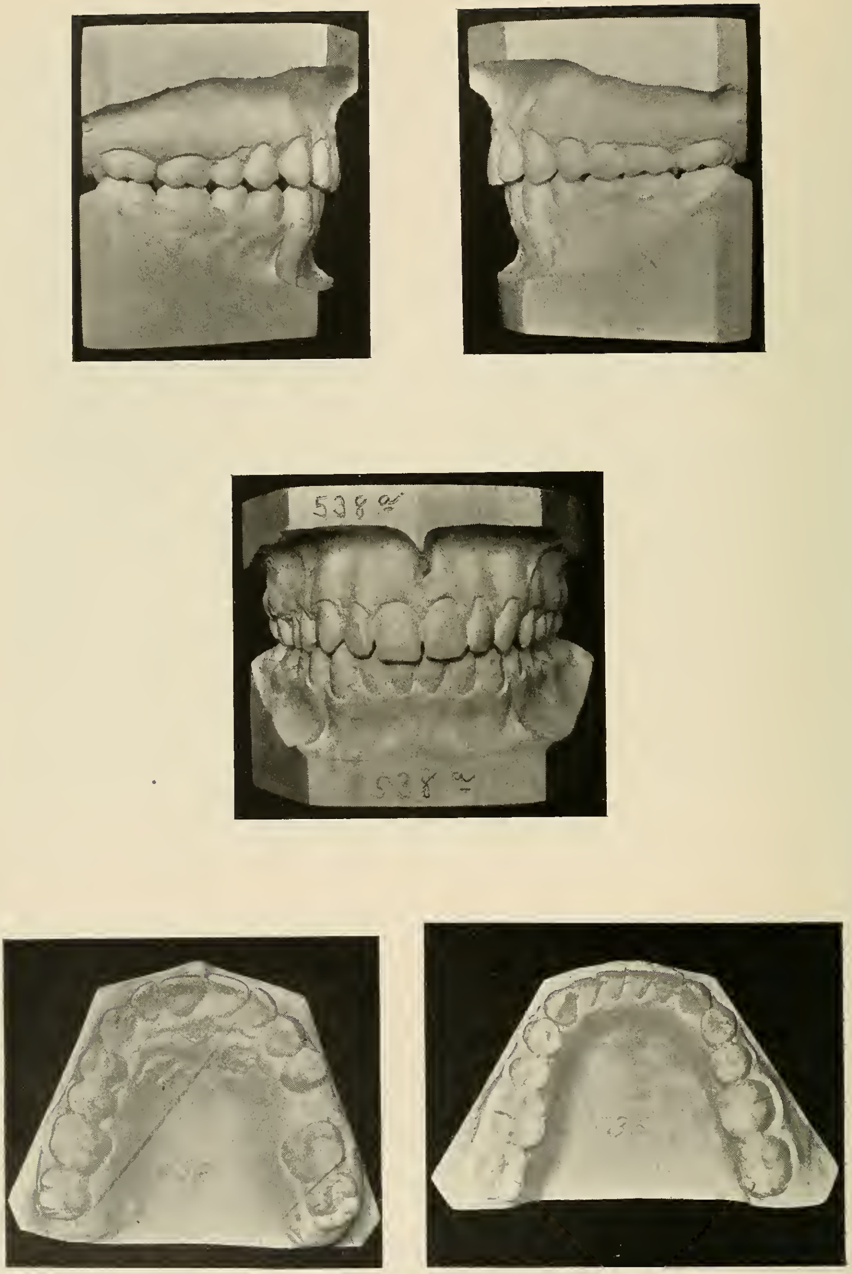


Fig. 43.

normal in relation to the lower ones in this case. These molars were moved distally without any application of intermaxillary force, and as Dr. Grunberg has shown by means of the symmetroskop, that the majority of our subdivision cases in Class II and Class III are really cases in which the buccal teeth on one side have drifted forward, and careful examination of the models of a number of treated cases shows that these teeth have moved distally without any effort being made to cause this distal movement.

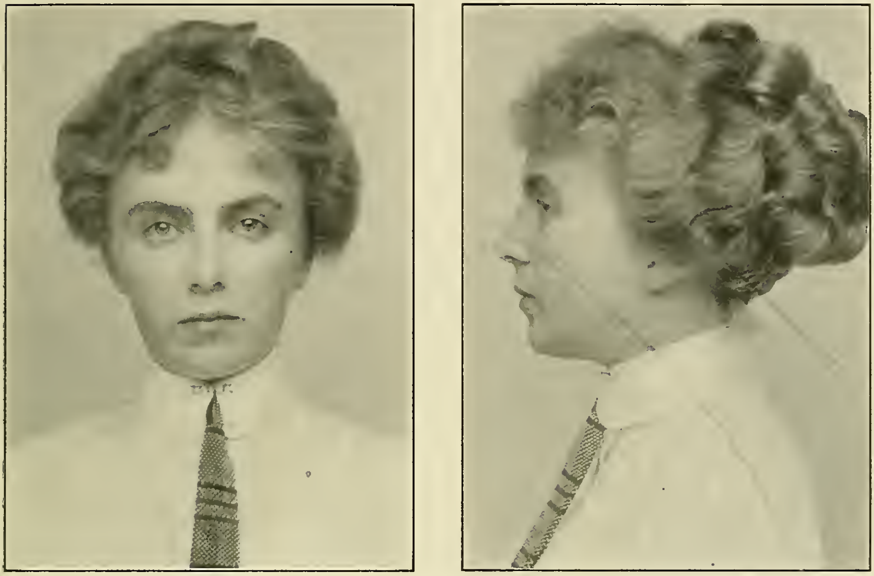


Fig. 44.

Extending the Scope of Orthodontia.

By R. C. Willett, D.M.D., Peoria, Ill.

Read before the American Society of Orthodontists at Chicago, July, 1913.

Problems are ever confronting us, no matter where we may find ourselves on life's road, whether as individuals or as a society banded together to promote matters of mutual interest.

Since attending the meetings of the American Society of Orthodontists and my admission to membership, I find that there are other men here like myself who are confronting the problem of establishing an orthodontic practice in a city of less than one hundred thousand population.

In presenting this subject for discussion it is with a view to getting an expression of opinion from the older and more experienced orthodontists relative to extending the field of practice.

I entered the exclusive practice of orthodontia in a nearby larger city after ten years of general practice of dentistry in a city of ten thousand population, and it was there that I came to realize the true situation that confronts the conscientious dentist when obliged to consider orthodontic treatment for a child patient coming under his care.

Before I took up the study of orthodontia with a view to entering the exclusive practice elsewhere, my only idea was to eliminate the neglect and in a way give a more complete service to the younger patients where, for reason of age, it was not practical to send them away from home where they could be under the care of the specialist. It was through my preparation to do the orthodontic work required in my own general practice of dentistry that I became convinced of the opportunities existing to establish an exclusive practice outside of the larger cities. I will relate a little of my experience in attempting to establish such a practice and to extend the work in a new field. The one I choose I do not believe to be any different from any other section of our country under normal conditions.

Establishing a Practice in a Small City.

I sent out the usual formal notices to the dentists of my adopted city and also to those dentists in the neighboring counties.

The matter of getting the people to concede to my demands in payment of a sufficient fee to enable me to properly carry on the work, or to convince them of its importance, has not been my greatest problem by any means. It has been the weeding out of false ideas in the minds of the dentists, as well as the laymen, which are contrary to all modern orthodontic principles.

Soon after sending out the announcement that I had discontinued general practice, and would in the future limit my practice to orthodontia, I was receiving models of cases of every description. In almost every instance they were those of patients far removed in years from the age we find it most practical to treat. The ages ranged from fifteen to thirty. Many of them were cases where a well-meaning and conscientious dentist had advised waiting, or where the case had been mutilated through extracting teeth. The idea of beginning treatment at an early age seemed to have been the furthest from the minds of the dentists.

Frequently these out-of-town patients were referred and came themselves with great hopes and expectations of receiving a much-needed service, but for which they were coming too late in life. These same conditions confront the orthodontist more or less in all parts of the country, I do not doubt, but the fact that such ignorance relative to orthodontia does exist would make it seem that in limiting orthodontia to exclusive practice the great benefit in our work has been at the same time limited to a selected few, and untold thousands are neglected.

The patients were coming from representative dentists of the smaller towns, dentists I well knew to be far above the average in other lines of general practice. Many of these dentists had given me great encouragement to enter orthodontic practice, and it was evident to me that if they were interested enough in orthodontia to refer permanent dental cripples who were ready and willing to pay well for any service that might benefit them, some effort should be made to direct their attention to the child patient of an age where we are in a way able to assure results.

It is possible that my sympathy is more with the smaller city and village dentist than some, having practiced myself so long in like localities. For that reason I cannot believe, as one well-known orthodonist and teacher has often said, in speaking of dentists of the smaller city, that it is a problem for the dentist to work out for himself, and not one for the orthodontist to have very much to say about, and at the same time this man expresses anxiety for fear that the dental profession will do more to retard than promote the progress of orthodontia.

Being located one hundred and fifty miles from any other orthodontist in exclusive practice, I felt that I would not be overstepping the rights of a fellow practitioner if I undertook a scheme of my own to change the character of cases that were being directed to me. At the same time I hoped to instil something in the minds of neighboring dentists to counteract the early teaching relative to the work. I selected the names of one hundred and fifty dentists from the neighboring towns, to whom I had sent announcements when I entered exclusive practice, and mailed to them a letter, in which I spoke of the most desirable age at which the orthodontist of to-day desired to receive patients for treatment. I also suggested a plan of co-operative treatment through which we might overcome the inconvenience to the younger patients, where distance was a serious obstacle to my taking the individual care of the case.

The result of this letter was not altogether spontaneous, but is slowly showing its effect. During the six months following the sending out of that letter I was invited to take part in seven different meetings of neighboring district societies. As a subject for essays before these smaller societies, where the attendance was from twenty to thirty-five members, I avoided anything of a technical nature. The following is a partial list of subjects selected:

Orthodontic Papers before General Practitioners.

1. "That Phase of Orthodontia Not a Specialty." In this paper, the importance of making an early diagnosis and the dentist's duty in seeking the casual factors that might result in later anomalies of development was discussed.

2. "The Relation of Orthodontia to General Practice."

3. "An Important Relation, Dentistry, Orthodontia and Rhinology." This paper was given more as a symposium between a rhinologist and myself.

My attempt was only to give them something of the fundamental principles upon which the orthodontist of to-day is working. The importance of observing the early development of irregularities, diagnosis of the various types of irregularities, and their etiology.

At these smaller meetings the essayist can get closer to the dentist and get the attention of many men who would skip all papers pertaining to orthodontia at a State Dental Society meeting, and who would never get into an open discussion following the reading of a paper. Here they enter into the discussion and ask questions. There are no side attractions nor extensive programs from which they may select such subjects as may interest them.

I realize that the subject matter presented at these meetings had been gone over many times before and many times better written by gentlemen present than I could ever do it, but how few dentists have grasped the idea as set forth in the published article, even if it has been read? Here I was able to tell it so that I could be understood and keep away from the technical features of our work, besides answering questions as they came up in the discussion.

I wish to say that the result of these meetings which I was invited to address has to a great measure changed the character of cases I am now receiving from out of town.

The notion that only a few of the cultured people of wealth in the cities will avail themselves of the services of an orthodontist is a mistaken idea. Our field is just as broad as that of higher education. They go hand in hand. Our service adds to the personality, the health and happiness of the individual we serve, and without that what will the child's future be?

Discussion on the Paper of Dr. Wilett.

Dr. T. E. Grisamore, Chicago. I wish to compliment the essayist on his paper, and I want to say that he has been one of the few men who has had the courage to go into a country town or small city and limit his practice to orthodontia, and I think in so doing he has proved to this section of the country, at least, that orthodontia can be practiced in other places besides large cities like Chicago, New York, St. Louis, etc.

He made one point in his paper that I would like to emphasize, and that is with regard to appearing before general practitioners with papers on orthodontia. It is true, that as soon as you announce the title of a paper on some topic in connection with orthodontia, three-fourths of the audience will immediately leave the room; that is an audience of general dental practitioners. That has been brought about largely, I feel, by men who have read papers and have tried to report the most difficult cases they have had. They have tried to show the wonderful things they could do, instead of trying to show the general practitioner the more simple things that they can do, and I think, possibly, we are at fault largely for the way the general practitioner feels regarding papers on orthodontia. If we were to take up the simple points, as Dr. Willett has suggested, and dwell on them, instead of talking about our difficult cases, these dentists would receive our papers with better grace and would be glad to hear papers from orthodontists.

Dr. Grafton Monroe, Springfield, Illinois. I want to say that I am a confrère of Dr. Willett, and have been working along the line of exclusive practice in orthodontia, but have not gotten to the point where the doctor has as yet.

Along the line of getting people interested in young patients, it seems to me that this is a very important phase of the subject under consideration. Those who are engaged in the regular practice of dentistry are very apt to advise delay in sending young patients to an orthodontist. I have repeatedly had folks come to me with children, with the report that their dentist had said "let the child alone; there is time enough to commence when the child has all the permanent teeth in the mouth." We all know how erroneous that is. In my feeble efforts I have been dropping a word at dental meetings, pointing out the importance of early correction, and I find dentists are beginning to comprehend, and a number of patients are being brought in now at a much earlier age, whereas formerly the older ones were the only ones we had.

This paper is worthy of our commendation, and I think Dr. Willett is working in a field where he will help all smaller towns and help those who want to go into the work in smaller towns.

Some Observations on the Development of the Temporo-Mandibular Articulation and Mandible, and their Relation to the Treatment of Distocclusion and Mandibular Retroversion.

By M. N. Federspiel, B.Sc., D.D.S., M.D.

Professor of Oral Surgery and Orthodontia Dental School, Marquette University, Milwaukee, Wis.

Read before the American Society of Orthodontists, Chicago, July, 1913.

I fully realize that I have taken up a subject for study and discussion that will demand much scientific investigation before the profession will be willing to accept my findings. Time, of course, will bring to light more, if my colleagues will assist in developing further knowledge pertaining to the pathological and physiological changes in the temporo-mandibular articulation.

At this time permit me to state that embryological literature pertaining to this area is not authentic. Writers seem to differ in their views—a fact which is also true of the mandible. Anyone who has attempted investigating the growing of the mandible and its joint soon realizes that it is a difficult matter to obtain specimens and far more difficult to make dissections for gross and microscopic study.

The modern treatment of the so-called distocclusion, or Class 2 (Angle), or, as I prefer to call it, mandibular retroversion, is by the use of intermaxillary force and lingual inclined planes. Results are usually satisfactory if these cases are treated during the period of tooth eruption. It is rarely possible to obtain permanent results in such cases if treated after the developmental period.

Clinical observation during the last ten years has wrought many changes in the treatment of malocclusion and dento-facial deformities. This is due no doubt to the fact that our knowledge of diagnosis has from time to time been modified, owing to the many complex cases that conflict with the preconceived notions of the orthodontist. It is probably admitted by the majority of specialists that orthodontic diagnosis, as it has been viewed in the past, gives little assurance of successful results in a large number of cases.

I do not wish to convey the idea that the thousands of cases treated in the past have not been benefited; but I have observed cases in my own practice, and many cases treated by eminent orthodontists, wherein the results showed a splendid correction at first, and in which after a few years there was a change from an ideal occlusion to a marked malocclusion. Especially is this true in cases diagnosed as distocclusion, or the so-called Class 2.

You will agree that cases in which patients show a distal relation of the lower teeth to the upper have been diagnosed as Class 2, or distocclusion. In other words, such an abnormal relation of the teeth meant that the maxillary arch was in a normal position in the upper jaw, and the mandibular arch was in an abnormal position in the lower jaw, a form of malocclusion known as arch malrelation.

I do not wish to imply that I fail to recognize the importance of normal tooth eruption. It is admitted by all scientists that the normal function of mastication plays an important part in the normal development of the maxillary bones. But I am convinced that many forms of malocclusion and dento-facial deformities are not primarily due to faulty tooth eruption, but to other conditions. This effect is a factor in causing abnormal eruption to be the outcome. In other words, I am more and more inclined to believe that the forces of normal eruption and the forces of normal occlusion are to a large extent regulated through glandular manifestations, which I will take up later, and also to the inequality of the muscular action, as well as to the unbalanced intra- and extra-maxillary pressure.

For a long time I believed that the upper first molar always erupted normally; that if the manibular molar was distal to normal the case should be diagnosed as Class 2 (Angle), or, as Lischer puts it, distocclusion: that to fulfill the highest aim in the treatment of orthodontic cases it is necessary to obtain a normal relation of the inclined planes when the jaws occlude; that the forces of normal occlusion are a factor in permitting the jaws and adjacent structure to develop along normal lines; that the growth of the mandible depends largely on normal eruption of all its teeth.

Let me call your attention here to the case of a young lady nineteen years old, a Jewess, who came to my clinic. She informed me that she had never had any lower diciduous teeth, and that at the age of twelve years the second mandibular molars erupted. The X-rays showed and there were no other teeth in the jaw. The upper arch contained two centrals, two laterals, one right diciduous cuspid, two bicuspids and two molars. (See Fig. 1.)

Upon inspection and palpation I found that the maxillary bones were well developed—the relation of the molars normal. Examination of nose showed nothing pathological, health excellent. What I wish to bring out is that, notwithstanding the failure to have a full set of teeth, the jaws had nevertheless developed to their full size. The question might be asked, "Would the jaws have developed or have been properly balanced had the young lady been a sufferer from pathologic conditions in the adjacent structure or elsewhere? Would any glandular manifestations or inequality of jaw muscles, etc., have permitted the jaws to develop as they did?"

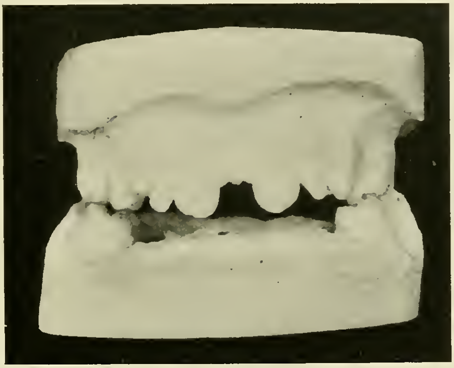


Fig. 1. Shows models of case where there were no deciduous teeth.

Medical literature is replete with reports and variations in the development of the skeleton. Thus, for instance, skeletons with eleven or with thirteen free ribs only are not uncommon. The form of the skeleton as a whole and of the individual bones which compose it depends partly upon heredity, partly upon the mechanical and chemical influences to which it is subject during growth of the individual. Abnormal stress of muscular or other origin, and abnormal lack of stress, as in the case of muscle paralysis, both give rise to bones and joints abnormal in form.

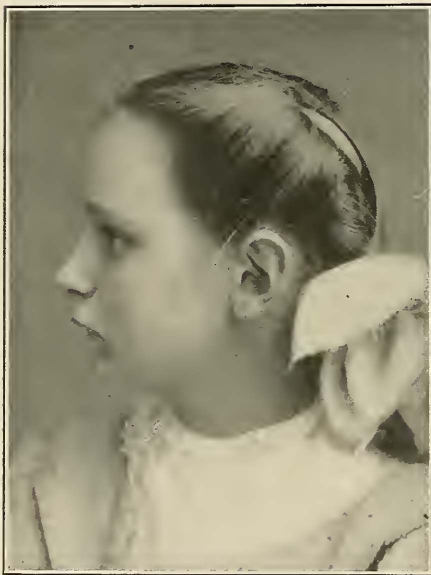
Hypoplasia. Hypoplasia, under development of the skeleton, may be due either to prenatal or postnatal conditions. This may be due to:

(1) Lack of active proliferation or cartilage.

(2) Inactivity in the process of ossification, membranous, subperiosteal or endochondral.

(3) A premature union of epiphyses with the main part of the bone.

(4) Inflammation and other abnormal conditions affecting the growing parts of the bone.



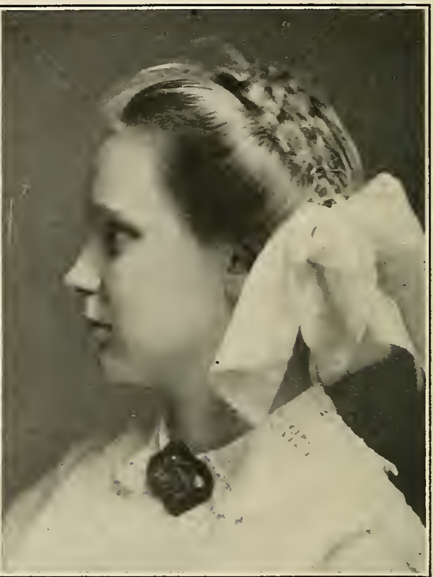


Fig. 2a. Shows a condition wherein the mandible is in retroversion.

Fig. 2b. Shows same patient wherein the lower jaw was shifted mesially giving the patient a normal facial outline.

Usually in cases where there is underdevelopment of the skeleton the long bones are especially affected and appear short and thick. The pelvis and thorax usually small. The root of the nose is broad and frequently sunken in.

Hyperplasia, overgrowth of the bones, is due:

(1) To an excessive activity of membraneous or subperiosteal ossification.

(2) To a prolonged activity of growing epiphyseal cartilages.

Hyperplasia. Hyperplasia may be local or general, and may give rise to a well-proportioned or disproportional enlargement of the skeleton. The causative factor in bringing about variations in the position and shape of one or more bones is obscure. It is said that the removal of testicles early in infancy, or congenital absence of the testicles, may lead to excessive prolongation of the activity of the epiphyseal cartilages and hence to giganticism. Phosphorous and arsenic in small doses are said to promote bone growth. Irritative stimulus, such as a blow, and even a small center of inflammation (osteomyelitis, ostitis, etc.), may excite activity in the processes concerned in ossification and induce abnormal growth in size of bone. Some diseases involving both the bones and certain glands have led to the belief that glandular condition is a factor in producing abnormal bone growth.

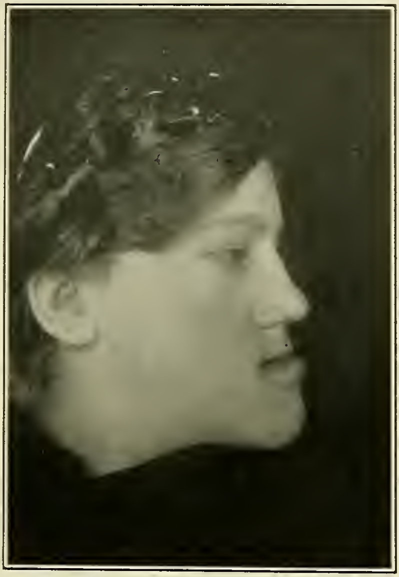


Fig. 3. Mandibular macrognathia. Age 13 years.

Modified Development of Maxillary Bones.

While a deviation from the normal relation of teeth will modify the development in the maxillary bones, I am inclined to believe that that modification extends only to a limited area. Permit me to say, in other words, that malposition of the teeth will bring about a deficient development of bone surrounding the teeth. This relates only to neutroclusion, or the so-called Class I.

In arch malrelation known as distocclusion and mesiocclusion a different problem confronts us. In many of such cases it is not deficiency of bone, but rather a malposition of the mandible, or probably

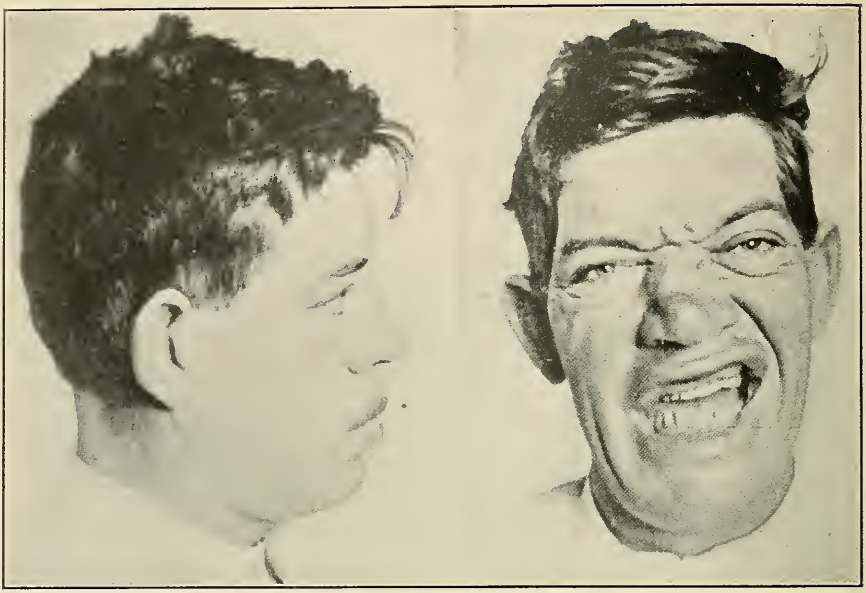


Fig. 4. Note maxillary rather than the mandibular prognathism of the true acromegalic; also posterior position of the ears. (Cushing.)

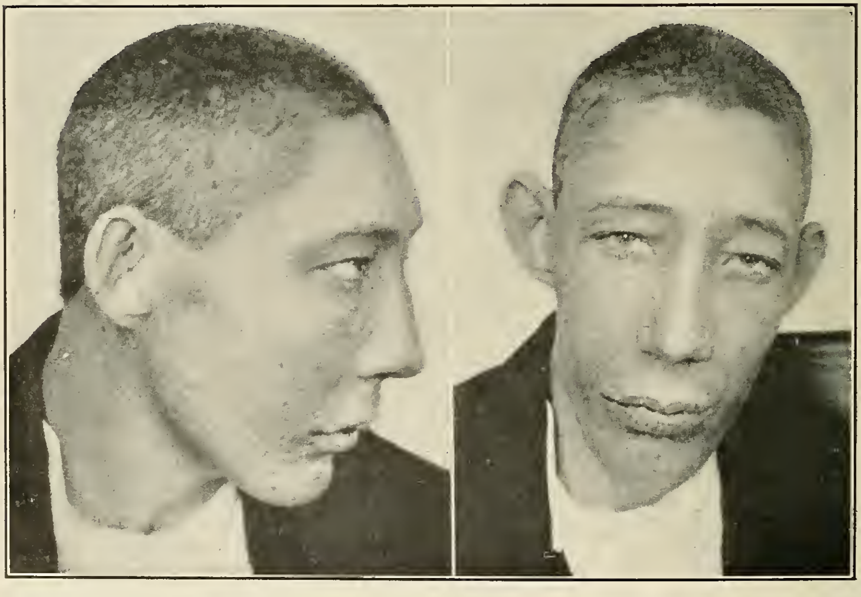


Fig. 5. Left showing marked frontal protrusion, thick lips, etc., in profile. Right, patient in the act of showing teeth while jaws which meet only on the right are held closed. Note the deep furrows of the thickened cutaneous tissues. (Cushing.)

a deficiency or excessive development of the maxilla. If the mandible is fully developed and contains all of its teeth, and if upon inspection we find the lower arch distal to normal, may we not consider such a case a normal relation of the teeth to the jaw with a faulty occlusion, due to malposition of the jaws? (See Figs. *2a, 2b.*) Or suppose we find upon inspection that the mandible is large and massive in size with its teeth anterior to normal, may we not incline to belief that the growth of this bone is regulated by the same force that governs the osseous system? (See Fig. 3.)

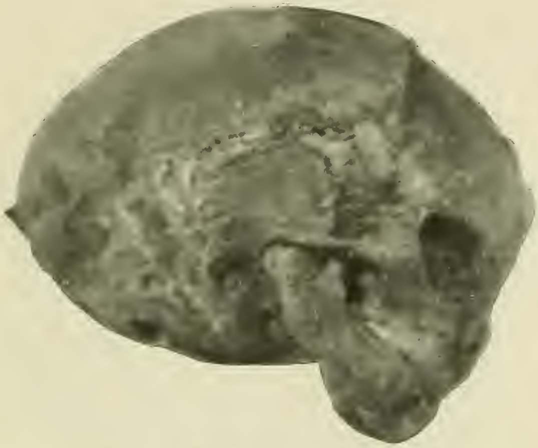


Fig. 6. Foetus at 7 months. Note temporo-mandibular joint.

Function of the Pituitary Body.

Evidence in medical statistics is fast accumulating to show that the pituitary body, which weighs only from five to ten grains, and is situated near the anterior part of the base of the brain, mysteriously governs the shape, size and form of bone growth. (See Figs. 4, 5.)

Keith describes certain changes occurring in the jaws of man when associated with acromegaly. He states that the growth of the jaw bones is so co-ordinate that the upper and lower teeth fall into correct relation. He further says there are at least two factors concerned in this co-ordination.

(1) A substance evidently derived from the pituitary body which acts on the osteoblasts so that they respond readily to certain stimuli.

(2) Certain forces which act directly on the jaws. These stimuli arise from the forces of tooth eruption and from the forces of muscular activity, which act chiefly on the lower jaw.

This brings us to a discussion as outlined in the title of this paper.

Development of Temporo-Mandibular Articulation.

While much has been said relative to the development of the mandible, I find that the development of the temporo-mandibular articulation in regard to its formation is far from being understood.

Keibel and Mall, in their book on embryology, claim that this joint is developed between the membrane which covers the condyle of the mandible and the periosteum of the squamosum. In loose tissue between the two a condensation marks the beginning of the differentiation of the *"discus articularis."* On each side of this *"discus"* a joint cavity develops. Each joint cavity is throughout life lined by fibrous tissue. Beneath the joint periosteum of the mandible and of the temporal bones a thin layer of cartilage is produced. According to Wallisch, in the new-born the *tuberculum articularis* is still underdeveloped and the condyle is flatter than in the adult. (See Figs. 6, 7.) The condyle reaches its definite form and the tuberculum is developed after the teeth appear.

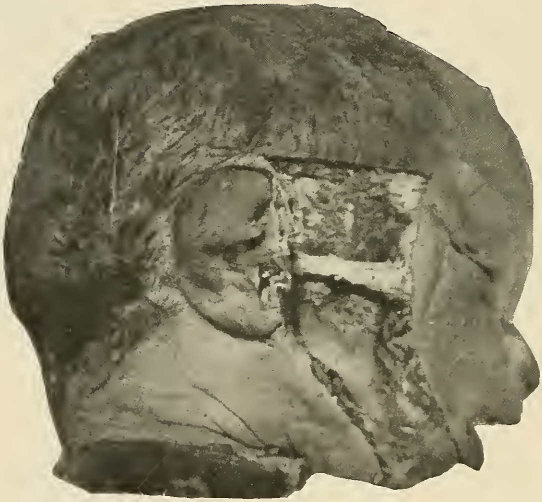


Fig. 7. Infant 2 months after birth. Note shallow glenoid fossa.

Personally, I am of the opinion that the temporo-mandibular articulation develops in shape and depth during the period of tooth eruption. I am satisfied that its position, shape, size, etc., are influenced by the direct reaction of the muscles which control the mandible.

I have observed in the history of a number of cases of mandibular retroversion, that the patients, prior to the eruption of the permanent teeth, showed no signs of malocclusion. That after the child began to breath through the mouth instead of the nose the mandible slowly and gradually drifted distally and the upper anterior teeth began to protrude. (See Fig. 4.)

I have come to the conclusion that this change to malposition of the mandible, complicated by malposition of the teeth, is brought about by unbalanced muscular force. Nasal stenosis will, in time, influence the shape of the temporo-mandibular articulation and surrounding area, and if not corrected during the period of growth will render the prognosis unfavorable in correcting mandibular retroversion by orthodontic procedure.

Discussion of Dr. Federspiel's Paper.

Dr. Martin Dewey,
Kansas City, Mo.

Yesterday I made the statement that six months is long enough to retain teeth if we have the proper development of bone, but since listening to Dr. Federspiel's paper, and the wondrous things which he claims the pituitary body causes, I have decided to give extract of pituitary body and retain the teeth only six days. But laying all joking aside, there is no doubt but that certain diseases of the pituitary body does cause abnormal development of the bone, and that the removal of the body experimentally produces characteristic results. However, I believe that very few of the malocclusions which we find, in fact, I believe none that I have ever seen are the result of diseases of the pituitary body. Dr. Federspiel showed several cases which had been diagnosed as pathological conditions of the pituitary, and one thing which I could not help but notice is that there were other deformities besides those found in the mandible. Therefore, I do not believe that in those cases in which we find an overdevelopment of the mandible. that we can lay such a condition to the pituitary body; for if it has produced overdevelopment of the mandible, there would be overdevelopment of some of the other bones. He also called attention to a paper which he read several years ago and seems to think that some cases of malocclusion are caused by overgrowth of the mandible, but I believe that there is little evidence to support that point of view. I believe that the overdevelopments of the mandible which Dr. Federspiel showed, in the extreme cases of those young men, had been the result of the malocclusion of the teeth, which produced abnormal forces that caused the mandible to become overdeveloped. In other words, the overdeveloped mandible is the result of the malocclusion and not the cause of malocclusion.

In regard to the relation which the temporo-mandibular articulation plays in malocclusion, my studies of cases and skulls lead me to believe that in the majority of class II and III cases, or distal relation and mesial relation of the lower teeth, that the condyle occupies the same mesio-distal relation that it does in normal occlusion. There may be a few mesial relations which have been the result of partial luxation, but they are rare, compared to the class III cases in which the condyle occupies its proper position. I do not believe that the condyle is of the same shape in all individuals, nor that it travels in the same plane in all cases, for one would learn otherwise who examined a few skulls or measured the paths of a few condyles. The reasons for this difference in shape and difference in paths lays in the occlusion of the teeth. The

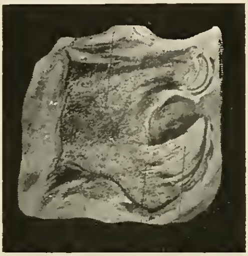


Fig. 1.

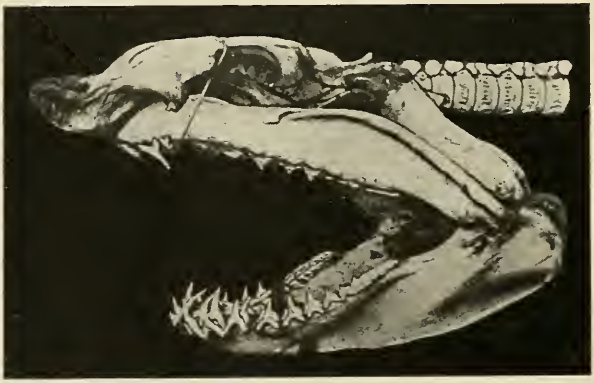


Fig. 2. Shark.

teeth have been the factors which have caused the condyles of different people and animals to assume different shapes. In a paper I read before the National Dental Association at Denver upon "The Relation of the Cusp, Contact Point, and Temporo-mandibular Articulation," I made the statement that the development of the temporo-mandibular articulation depends upon the occlusion of the teeth. That the depth and shape of the glenoid fossa with the shape of the condyle depends upon the length of the cusp, and that the width of the condyle depends upon the width of the teeth.

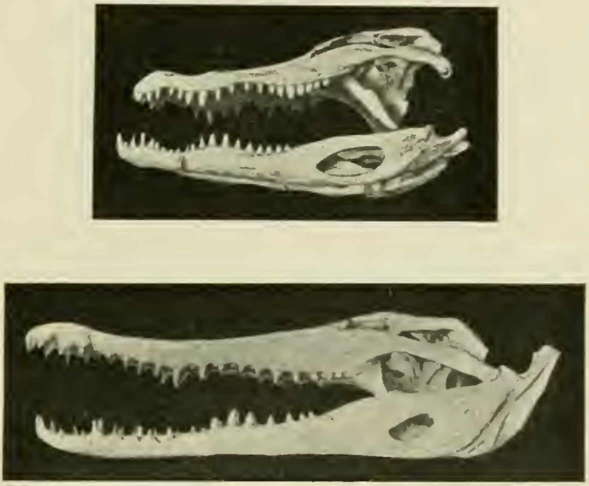


Fig. 3. Crocodile.

I will not give you that entire paper, but as Dr. Federspiel took up the development of the temporo-mandibular articulation, I will only speak of that phase of the subject and show you how occlusion has effected changes in some cases.

Beginning with comparative dental anatomy, for we find the same rules working there that work in man; I will show you the skull of a rattle-snake (Fig. 1). The teeth are conical, with a highly developed poison apparatus and shaped for prehension and deglutition. The temporo-mandibular articulation is shaped to allow the animal to swallow large objects; there is no occlusion of individual teeth, yet the shape of the teeth and the function to which they are put causes the loose articulation of the bones of the lower jaw with the cranium.

Next we have the jaws of a shark (Fig. 2). The teeth are not so long, the food is not swallowed in such large "chunks," but there is no occlusion of individual teeth. The condyle and glenoid fossa is poorly developed and is very much the same as is found in any of the higher animals. If you pass to the higher reptiles you find a greater development of the temporo-mandibular articulation as the functions of the teeth increase. An interesting example is found in the alligators and their cousins (Fig. 3), for in them conditions have been such as have caused the glenoid fossa to develop on the ramus and the condyle on the temporal bone. Owing to the short legs of the animal and the long jaws, the mandible is so close to the ground that it is impossible for the animal to open the mouth except by moving the entire head.

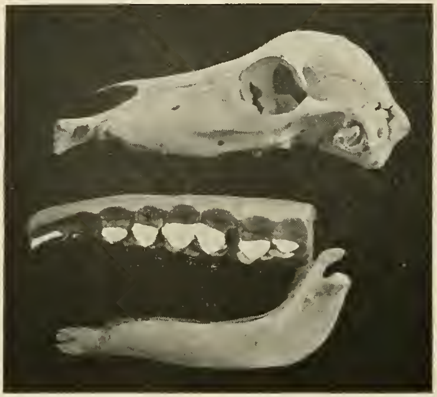


Fig. 4. Foetal Horse.

In the mammals, the condyle develops as the teeth erupt and come into use, and as they are lost, the temporo-mandibular articulation changes. A good example of this is shown in a series of horse skulls which are in the American Museum of Natural History, in New York. I will show you but three. Fig. 4 shows the skull of a male foetal horse at the fifth or sixth month of foetal life. The teeth have not played any part in the development of the temporo-mandibular articulation, which is shaped as all such parts are; as the result of years of development in the animal kingdom. The condyle which we find here is very much the same as we would find in a foetus of a carnivora before birth. It is very much the same as is found in the human, which I will show you later The point I wish to make here is that the condyle in any family of mammals does not take the shape characteristic of the adult animal until th teeth erupt. Fig. 5 shows an adult horse in which the condyle is typica of those animals. In the old horse (Fig. 6) the teeth are being worn down and with the loss of occlusion the condyle is changing.

Another species of animal which has a decided use for the teeth is the beaver. A beaver (Fig. 7) without teeth would soon be no beaver at all. The life of the animal depends upon the teeth. In fact, that is true of most of the lower animals, yet we find people who think man does not need any teeth. But this is not a lecture on oral hygiene. We observe that the condyle of the beaver is round, the glenoid fossa is lengthened antero-posteriorally, and the ligaments are so attached that the mandible can be protruded so as to bring the incisors together, which teeth do not touch when the molars are in occlusion. So the temporomandibular articulation is greatly modified, for the teeth perform a function which they are called upon to perform only in those animals with the scalpiform incisors. The shape of the condyle is characteristic of

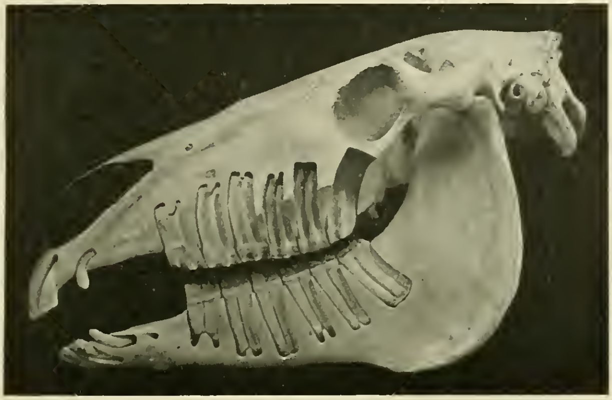


Fig. 5. Horse; age 5 years.

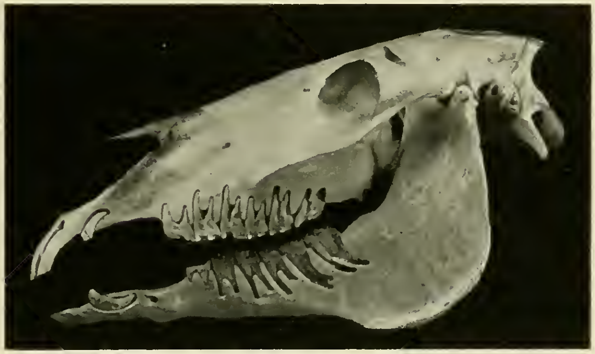


Fig. 6. Horse; age 27 years.

animals which do a great amount of gnawing with the incisors. I have a skull of an old person, who lost all of the molars and premolars and masticated on the anterior teeth and the condyle assumed the same shape as is found in the beaver. Instead of being wider bucco-lingually it is wide mesio-distally.

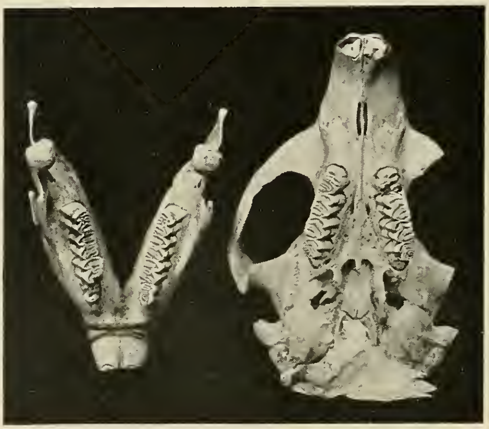


Fig. 7. Beaver.

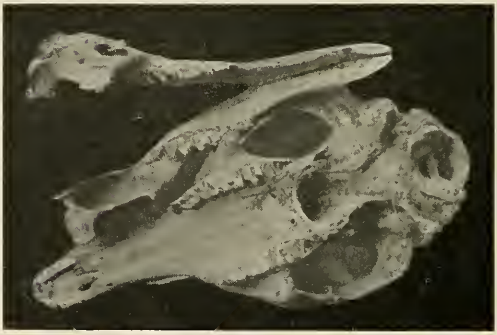


Fig. 8. Kangaroo.

In the kangaroo (Fig. 8) we have a lateral movement of the mandible instead of the antero-posterior movement as seen in the beaver. The difference in the condyle is easily seen.

Passing to the mountain lion (Fig. 9) we find a deep glenoid fossa and a narrow condyle antero-posteriorly. The greatest diameter of the molars and premolars is mesio-distally and the greatest diameter of the condyle is bucco-lingually. This rule holds true in all animals; the greater diameter of the condyle will be the reverse of the greater diameter of the molars and premolars (Fig. 10). The occlusal view of the mountain lion shows this. The long canines make an up-and-down movement of the mandible necessary and the condyle and glenoid fossa has assumed a shape to make that possible.

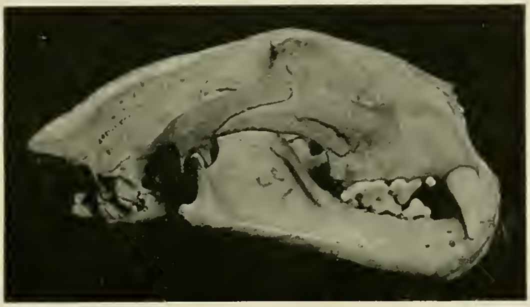


Fig. 9. Mountain Lion.

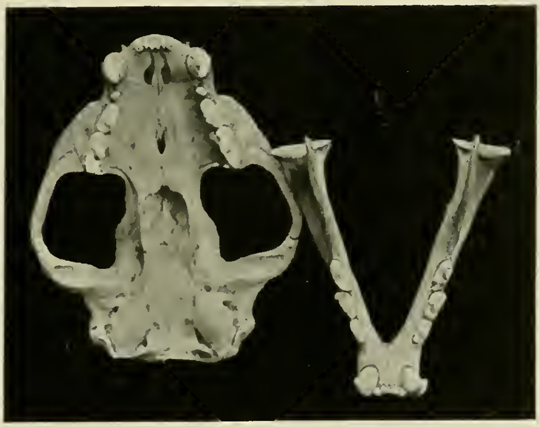


Fig. 10. Mountain Lion.

In Fig. 11 we see the teeth of a rattle-snake; decidedly conical teeth, in which the whole dental apparatus is one that is highly specialized so far as the poisoning apparatus is concerned, and the temporo-mandibular articulation is developed for prehension. We see nothing in the nature of a distant condyle.

The effect of the teeth on the temporo-mandibular articulation in animals closely related, is shown by comparing the wild hog of Mexico (Fig. 12) with the domestic hog (Fig. 13). These animals greatly resemble each other, but the long canines which still develop in the wild

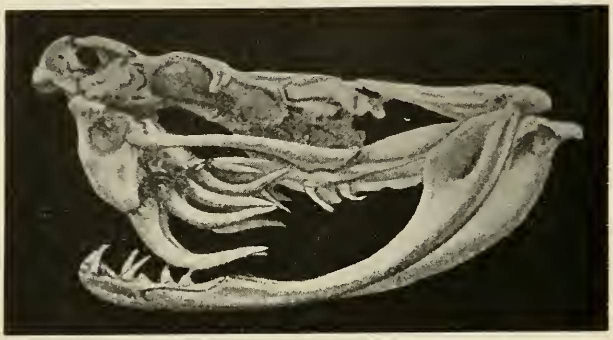


Fig. 11. Rattlesnake.

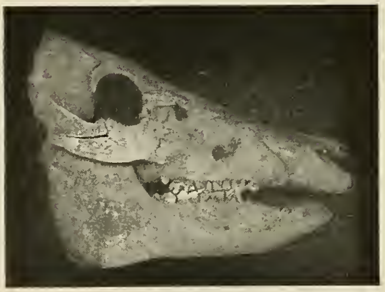


Fig. 12. Wild Hog.

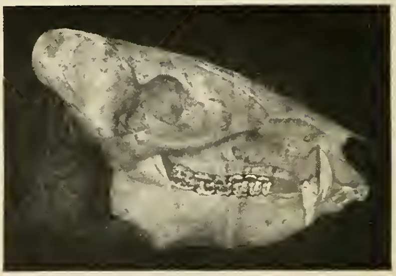


Fig. 14. Cave Tiger.

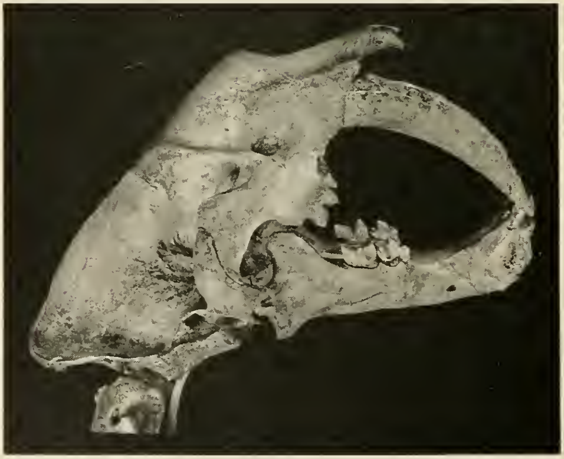


Fig. 13. Domestic Hog.

hog as a means of defense, have caused the temporo-mandibular articulation to greatly resemble the carnivorous animals. The domestic hog having been removed for the necessity of protecting himself, has his food provided for him; the canines have ceased to develop as organs of defense and the condyle resembles an herbiverous animal. These changes have been the result of the different development of the teeth.

The extent to which the development of a tooth may influence the development of the bones necessary to its function, is shown in the cave-tiger (Fig. 14), an extinct animal of North America. The great length of the canine made it necessary for the entire temporo-mandibular articulation to change, and the mechanical stimulation of the great upper tooth caused the bone to develop on the mandible to support the tooth.

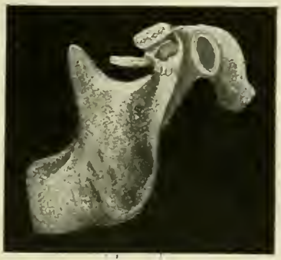


Fig. 15.

In man the temporo-mandibular articulation changes in response to the same influences as it does in the lower animals. It is made up of a number of parts which must be taken into consideration when discussing any changes that may occur. Besides the condyle and glenoid fossa, we have the external capsular ligament which is a white inelastic ligament which envelops the entire articulation. It spreads around the glenoid fossa and is attached at the neck of the condyle. There is the stylohyoid ligament and the spheno-mandibular ligament which are also white inelastic ligaments which run from the styloid process and the spine of the sphenoid to the mandible. These ligaments are of such a nature that they do not change as rapidly as the bone. Fig. 15 shows the anatomy of the temporo-mandibular ligament dissected out and is a cut taken from Piersöl's anatomy, as is the cut showing the styloid process and ligament. Owing to the extreme inelasticity of the ligaments of this joint, any change that occurs in the bones must occur without disturbing the attachments or length of the ligaments.

The condyle in man does not assume a definite shape until after the teeth are in occlusion as shown in Fig. 16. The final shape of the articulation depends upon the occlusion of the teeth. If all the teeth are present and in normal occlusion we will have a mastication apparatus and articulation as shown in Fig. 17. Fig. 18 shows a mandible which has different shaped condyles on the two sides. Owing to a malocclusion, the individual masticated only on one side. Fig. 19 shows three condyles, all of which have different shapes, owing to the different manner in which the owners of them masticated. These changes which occurred in the condyles were such as could occur without the ligaments changing.

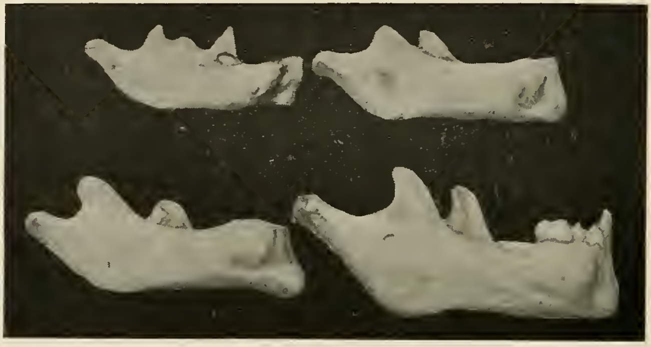


Fig. 16.

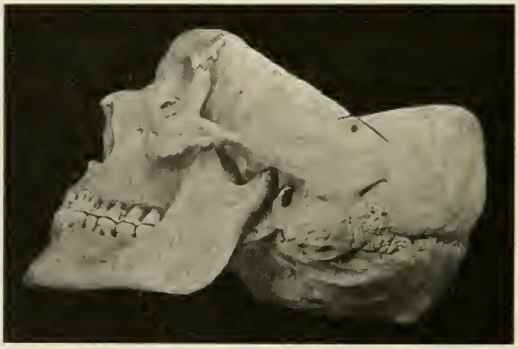


Fig. 17.

If you will look at Fig. 17 and note the position of the condyle in relation to the external auditory meatus, the styloid process and the mastoid process, you will have a good idea of what those parts are when normal. The next skull is one from Dr. Cryer's collection and shows what may be considered a normal relation of the parts (Fig. 20). It was necessary for the individual to masticate only on one side, with the result that the condyle changed in shape, but not in position. There was absorption of the eminentia articularis as well of the condyle; but in addition to those changes there was a building of bone on the posterior end (Fig. 21), which gives about the same relation of the posterior end of the condyle to the styloid process and external auditory meatus as was seen on the other side. On the abnormal side there was a shortening of the neck of condyle which would be necessary as the ligaments would not stretch. The changes which are produced by the occlusion of the teeth are similar to those produced by malocclusion.

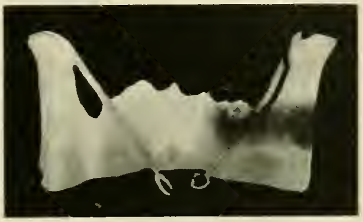


Fig. 18.

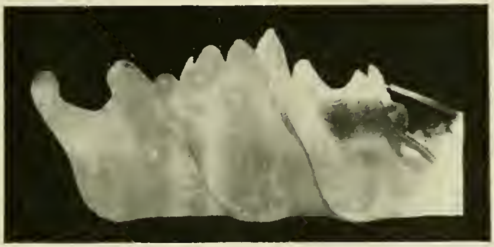


Fig. 19.

I have stated that I do not believe that the condyle changes position in Classes II and III. There has been little evidence given to prove anything either way. However, there is a skull (Fig. 22) in which we have a decided case of malocclusion. The lower teeth are distal to the upper, but the condyle occupies the same position as is found in the skull (Fig. 17) with normal occlusion. The ramus is short and the body of the mandible is underdeveloped. The abnormal condition exists in the mandible below the external capsular ligament. In a Class III case, all of the lower teeth are in mesial relation to the upper (Fig. 23). The mandible is overdeveloped because of the malocclusion of the teeth. The condyle occupied the same position as we find in the normal skull and in the skull with the class II case. While it takes more than two or three skulls to prove anything, I believe that a great deal of knowledge can be gained if we can examine a number of skulls which are known to have the mandible with them that nature put there. Therefore, in closing, let me state my position again. I believe that the shape of the condyle and the development of the mandible depends upon the occlusion of the teeth. Also that the position of the condyle has little to do with the distal or mesial relation of the teeth. Furthermore, that the lack of development of the mandible and the overdevelopment of the mandible

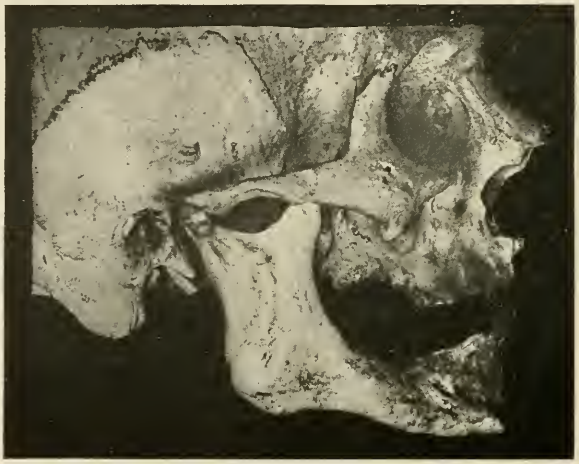


Fig. 20.

occurs at points below the external capsular ligament. And lastly, to prove anything in regard to the changes which occur in Classes II and III cases, a large number of skulls must be studied and something given besides theories.

Frederick C. Kemple, New York City.

Dr. Federspiel has shown a series of interesting pictures, beginning with apparently normal individuals. The next picture showed these same persons to be slightly deformed, the next one worse, and the next one still worse, until they were horribly deformed. He showed pictures of several cases of progressive deformity and says, "this is simply the effect of the condition of the pituitary body"; they were all produced through some abnormal condition of this organ. I would like Dr. Federspiel to tell us how he knows that these conditions are entirely produced by pathologic conditions of the pituitary body. I have had the impression for a long time that the function of the pituitary body was somewhat mysterious. I did not know that its function had been satisfactorily established.

Dr. Lischer, St. Louis. I regret very much that I have not had a chance to study this paper, because it is a subject in which I am very much interested. It is a continuation of the argument which the essayist presented in his paper at Boston, wherein he accepted the terms I suggested for certain types of malocclusion, and analyzed the basis that I offered for these terms, viz.: malposition of the teeth, malrelation of the dental arches, and malformation of the jaws. To these he would add *malposition of the mandible.* That appealed to me at that time and does now, and ever since then I have been observing patients more carefully when I make a diagnosis. I will admit that at times it is rather difficult to say whether a case is a distoclusion, or whether it is a mandibular retroversion; a mesioclusion, or a mandibular anteversion. These conditions may, it seems to me, blend by imperceptible gradations. As I said yesterday: whether we like it or not, it is our duty to work out the morbid anatomy of every type of dento-facial deformity. We must extend our observations beyond the study of occlusion and malocclusion as shown by plaster casts and by mere photographs of patients. It is our duty to make observations beyond that and to include the study of skulls of human beings in whom these typical oral deformities exist.

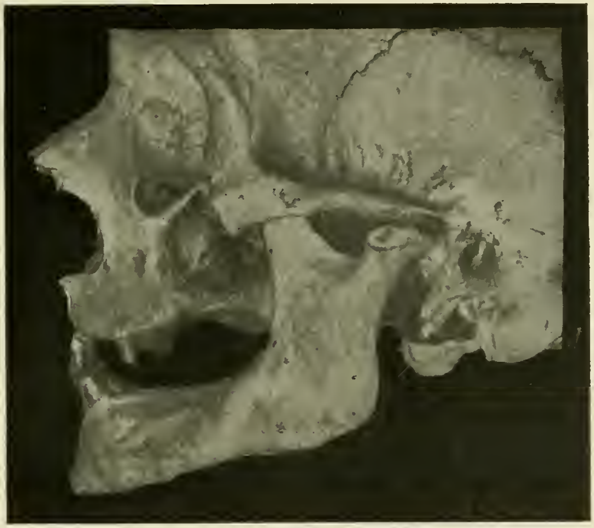


Fig. 21.

I believe Dr. Federspiel has undertaken a very important and fundamental work, and I urge him to continue it. I can conceive of no valid reason why jaws may not be abnormal in development, or growth; why a mandible may not be malposed in its relation to the other structures of the face. And if this is possible, as I confidently believe it is, it is of greatest significance to orthodontists.

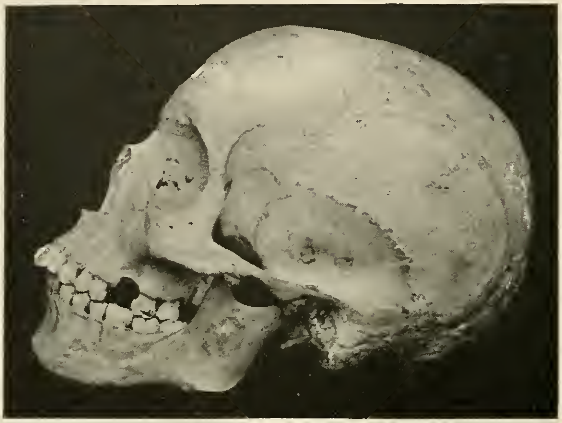


Fig. 22.

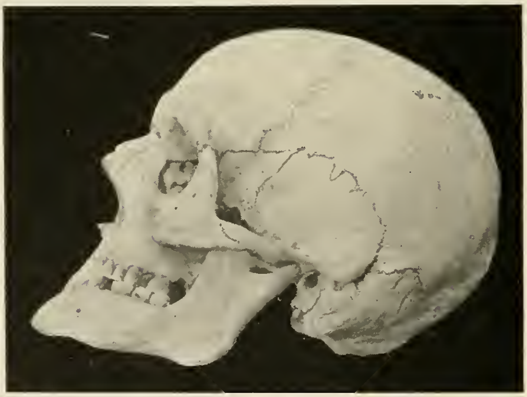


Fig. 23.

Dr. Kemple. I found two rather interesting skulls in the Wister Institute of Anatomy, at Philadelphia, a few years ago. In one of the mandibles the third molar was erupting partly back of the anterior border of the ramus. Looking at the mandible in profile, only about one-third of the third molar showed in front of the ramus. In the other mandible all of the third molar showed in front of the anterior border of the ramus. In these two mandibles the one that showed the whole of the third molar in front of the ramus seemed to be well developed and the one that showed only one-third of the third molar was an undeveloped mandible. The strange thing about these conditions is that the one that was an undeveloped mandible was a Class III when articulated with the skull, and the one I thought was a well-developed mandible was a Class II when articulated with the skull. There are stranger things in orthodontia than are dreamed of in our philosophy.

Dr. Ottolengui. Were these mandibles attached to the proper skulls?

Dr. Kemple. I think they were.

Dr. Federspiel. (Closing the discussion): Dr. Kemple asked a question regarding the pituitary body. I would suggest that Dr. Kemple look up and study the work of Dr. Cushing. He has been observing the action of the pituitary body. The point that I want to bring out is that we have to look further than an inclined plane when we wish to make a diagnosis of malocclusion and dento-facial deformities.

I am glad Dr. Dewey discussed the subject, but notwithstanding that my work is experimental, I am satisfied that the temporo-mandibular articulation is subject to variations in shape and position during the period of tooth eruption. It is a difficult matter to obtain specimens of the temporo-mandibular articulation. I had a splendid case I would like to have shown, but it was taken away from me by the parents of the child. It was a typical mandibular retroversion, the glenoid fossa was large and shallow.

In order to obtain a better understanding of the development of the temporo-mandibular articulation in its relation to malocclusion it is necessary to make a large number of dissections in children. Comparing the same to cases wherein the relation of the teeth are normal as well as the adjacent structures.

The Physiological and Pathological Resorption of Tooth Roots.

By Rodrigues Ottolengui, M.D.S., D.D.S., LL.D., New York.

Read before the American Society of Orthodontists at Chicago, July, 1913.

Late in the spring of 1908 a girl of eleven was placed in my care for the correction of malocclusion. The jaws were extremely small, narrow, and the upper arch marked V-shaped. The upper temporary laterals had been prematurely lost, with the result that the first bicuspids were in close proximity to the lateral incisors. The case belonged to Class I of the Angle classification. The routine of slowly widening the arches, and recovering the spaces needed for the cuspids was undertaken, but was necessarily carried on with extreme caution because of the ease with which the teeth could be moved, or rather tipped. I could recount the many difficulties met with in this case, and I am sure they would be interesting, as this is one of the records of failure for which the president of last year made a plea. But as the immortal Kipling has said "that is another story."

The story which I bring you to-day is of far greater importance than the mere history of a failure.

Treatment was carried on with short periods of rest until early in June of 1910, actual treatment exclusive of retention having covered about twelve months. Retainers were placed, and the case dismissed until the autumn. Early in October the patient returned for resumption of her treatment, and as there was still no signs of the eruption of the cuspids, though room had been made for both of them, the girl was sent to Dr. Schamberg for radiographic investigation, and here beginneth the real narrative. Dr. Schamberg called me up on the telephone and said: "The cuspids are both present, but I have sad news for you. The roots of the incisors are being resorbed." I was somewhat stunned, and I think that those of you who have never had a similar experience will share my feelings when you see the radiographs.

Fig. 1* is from the left side, and shows the cuspid pointing between the lateral and central, with a typical resorption of the lateral root, and by typical I mean as compared with similar resorption of a temporary tooth where we see it in connection with an almost erupted successor. Or, in other words, were this permanent lateral a temporary cuspid, we would expect the resorption of the tooth root to appear as it does in this picture. The permanent central, however, is somewhat different, and in the absence of other pictures we would hesitate to decide whether this root had been resorbed, or whether it had never been fully formed.

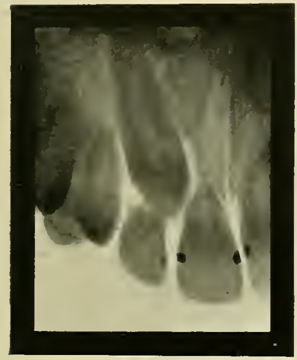


Fig. 1 (Schamberg).

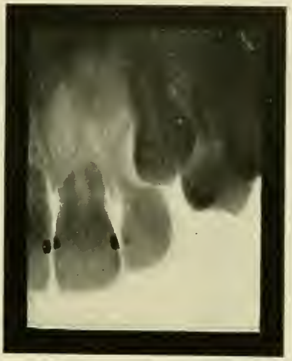


Fig. 2 (Schamberg).

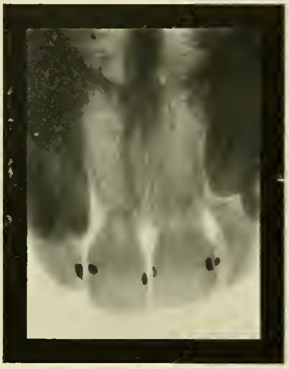


Fig. 3 (Schamberg).

Fig. 2 shows us the right side. Here we find the cuspid erupting between the lateral and the bicuspid, and this leaves us more than before, in doubt as to whether the shortness of the central root is due to resorption, or to lack of development.

In Fig. 3 we see the two central incisors, and the roots appear so short that it is difficult to believe that they never have been any longer. I could not doubt the fact that I was in the presence of a condition new to me, and so far as I knew, heretofore unreported in the literature. I had seen radiographs of cases where erupting third molars had caused resorption of the distal roots of the second molars, and by analogy I could comprehend the resorption of these lateral roots, and even of the root of the left central, but the resorption of the root of the right central was, and I may add, still is, a mystery to me.

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*I am indebted to Drs. M. I. Schamberg of New York, Sidney Lange of Cincinnati, and F. T. Van Woert of Brooklyn for radiographs. The name under each illustration will indicate the maker of the original radiographs.—R. Ottolengui.

It may be of interest to relate that during that winter I sent these radiographs to a number of radiographers, and received quite conflicting views. The patient's regular dentist declared that he did not think the pictures showed conclusively that the roots were resorbed. He pointed out that the cuspids might be sufficiently lingual or labial of the other teeth to erupt without causing traumatic injuries, and that these four incisors might eventually develop greater length of root. At least one radiographer advanced the same view as a possibility, and though I did not believe it, I felt obliged to give the child the benefit of the doubt. I did not care, however, to risk any further stress upon these teeth, and so treatment was delayed awaiting the pointing of one or both cuspids.

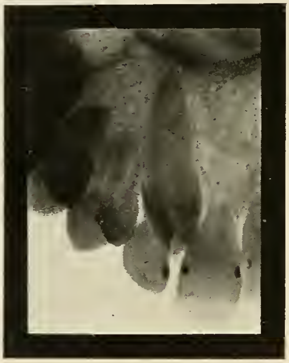
Fig. 4 (Ottolengui).

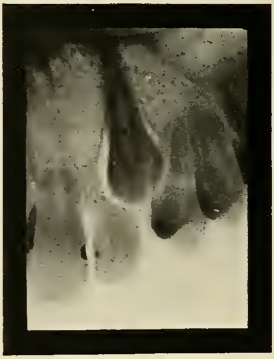
Fig. 5 (Ottolengui).

In September, 1912, the patient reported for examination, the left cuspid pointing through the labial gum, high up, and in slight torsion.

Fig. 4 shows the condition on the left side at that time. The lateral root has entirely disappeared, and though the central root does not appear to have diminished in size, the direction and close proximity of the oncoming cuspid was a menace to the central, and consequently the permanent lateral was extracted, and orthodontic interference immediately inaugurated. I have the extracted lateral, and it may interest you to examine it and to note how exactly like a shed deciduous tooth it appears.

Fig. 5 shows the right side at the same period. The lateral root shows progression of the resorption, while the central does not appear much altered. Unlike the left cuspid, this tooth will evidently point lingually. This is a point of interest, because here we have a case in which one cuspid erupts in a path slightly labial of normal, and the other slightly lingual of normal, and yet we find a destruction of the tooth ahead of it in both instances. Nor does the fact that the right cuspid lies lingual of normal seem to have saved the root of the central incisor on that side, which has resorbed despite of the fact that a tooth intervenes on each side of it, between its own root and the oncoming cuspids.

During the past winter the cuspid on the left side was moved away from the central incisor and down into position. Fig. 6 shows the condition on March 19, 1913. The shadows of the cuspid and bicuspid overlap so that the picture is slightly confusing, but shows definitely that the cuspid has been moved clear of the central. The cuspid on the right side has not as yet pointed. Fig. 7 shows the condition on the right side at the same date. The roots appear somewhat longer than in the previous pictures, but this is undoubtedly due to distortion.

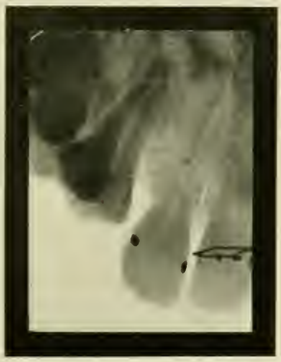

Fig. 6 (Ottolengui).

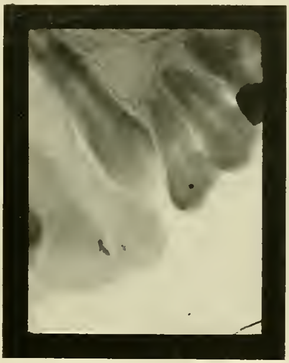

Fig. 7 (Ottolengui).

Resorptions Differentiated.

In the title of my paper I mention "physiological" and "pathological" resorption of tooth roots. By physiological resorption I mean that resorption of a root which occurs as a part of the normal routine, as when the roots of deciduous teeth resorb to accommodate the erupting successor. There is one marked clinical fact to be noted in regard to physiological resorption, and that is that the pulp of the deciduous tooth, though shortened with the root, remains alive.

By pathological resorption I mean a resorption inaugurated by some outside interference with the normal routine. There are several distinct kinds of pathological resorption, which are accompanied by clinical aspects, which are fairly constant when studied with the X-ray.

Let me pause here to make a statement. I am not counting myself as an histologist in this discussion. Indeed, I admit freely that I do not really comprehend the histology of these conditions, but, then, I may add with all deference, that judging by what they have written, the histologists themselves are not absolutely sure of their ground. In the main, these problems have heretofore been studied in the laboratory and with the microscope. I am bringing you such evidence as I have been able to collect with the aid of the X-ray and radiographers, and as some of this evidence seems to be in conflict with the expressed views of the histologists, and as I am recording the history of an unusual and heretofore unrecorded condition, I am hoping that the histologists will once more take up this study, and perhaps by combined effort bring some order out of the present chaos.

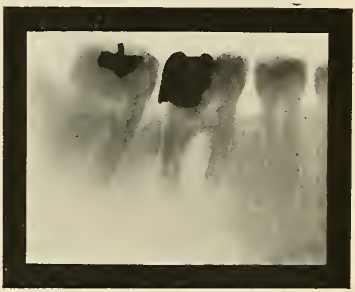

Fig. 8 (Schamberg).

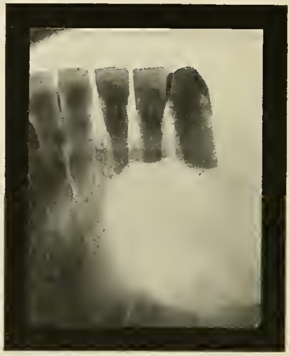

Fig. 9 (Schamberg).

Asking your pardon for this digression, which seemed necessary, let us return to the subject.

Pathological Resorption.

A common variety of pathological resorption is that found in connection with infections.

Fig. 8 shows resorption of the ends of the roots of a molar. This is pathological resorption due to alveolar abscess, the pulp dying prior to the beginning of the resorption.

Fig. 9 is a picture for which I am deeply grateful to Dr. Schamberg, who supplied me with this and the previous radiograph. This particular picture is of great interest because here we have extensive resorption of three roots, undoubtedly pathological in character, the resorption having been caused by a tumor, which has destroyed the roots and the pulps of a lower central, lateral, and cuspid. This picture serves well as a basis of comparison when considering the case already presented, and others to be shown, in which the roots of several teeth have been resorbed. In this tumor case we know that we are in the presence of a pathological condition, whereas in the others we are in doubt, and I may call your special attention to certain facts. In the doubtful cases, including the first one presented, the pulps remain alive, and as fast as the roots have resorbed, the alveolar bone has been rebuilded. Speaking broadly, we have there an osteoclastic action destroying the tooth root, rapidly followed by an osteoblastic action, which fills in the space in the alveolar bone which would otherwise be left by the destruction of the tooth root, if this bone building did not occur. It is also to this phenomenon that we may attribute the firmness with which the partly resorbed teeth are attached, the resorbed portions being in effect held by bony anchylosis just as implanted teeth are held, as will be presently shown.

Thus we find in the pictures of the first case presented that, though the roots of the teeth have been resorbed, the alveolar bone appears normally intact.

Quite the contrary is true in the pathologic cases; not only are the pulps dead, whether they die first and cause the abscess and resorption, or whether they die because of the resorption and infection from the tumor, but also we find that the same energy, whatever it is that destroys the tooth root, likewise destroys the alveolar bone, as is plainly seen in the two illustrations, Figs. 8 and 9.

Another type of pathological resorption may be called traumatic, and at first would appear to be closely analogous to the special condition under consideration.

I have known cases where an erupting third molar has caused resorption at the distal aspect of the second permanent molar. I regret exceedingly that I have no such picture to show you, but I shall earnestly endeavor to obtain one before publication. The point of interest, however, is that in these cases the resorption continues until the pulps become affected and die. I should like to see myself, and to have for your comparison, pictures of such cases in order to study the appearances of the alveolar bone, so that we may see whether the destruction is confined to the tooth root or includes the alveolus.

Implanted Teeth.

The clinical or radiographic picture of resorption occurring after the death of a pulp, we have seen in Fig. 8, where we noted that there is also a destruction of the surrounding alveolus. But there is one more type of resorption, that which occurs about an implanted tooth. For some years after the inception of the operation of implantation there was much discussion as to how such teeth are retained. There is little doubt, however, that the rotation of events is about as follows: Whether the socket be a drilled socket, or an old socket reamed larger, we have a traumatic injury, to repair which an osteoblastic action is set up. If no tooth were implanted this reparative process would continue until the socket were completely filled in. By introducing a root of another tooth we bring into position a foreign body, and nature at once attempts to evict the intruder. Osteoclasts appear and attack the root.

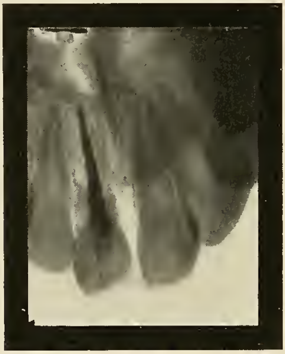

Fig. 10 (Ottolengui)

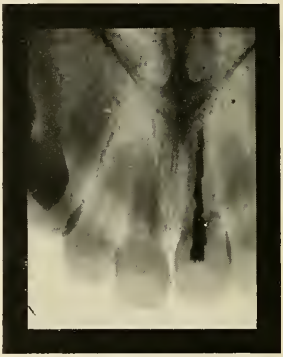

Fig. 11 (Ottolengui).

Where the implanted member becomes firm it is due to the fact that the osteoblastic has overcome the osteoclastic action. The osteoclasts have eaten bays into the cementum, and the osteoblasts have builded bone therein, so that anchylosis occurs.

Fig. 10 shows the root of a tooth implanted by myself, and was taken one year after the operation. A comparison with the roots of the teeth adjacent shows how different is the attachment. In the adjacent lateral and central we see the space around the root caused by the presence of the pericementum, and we note the clean, smooth appearance of the roots. In the implanted tooth we see the pericemental space bridged across with bone, and the entire tooth root roughened.

Fig. 11 is from another implanted tooth, taken about two years after replantation. Perhaps I should say, to be accurate, that both these teeth were replanted teeth, having been accidentally knocked out. This particular case was implanted by another dentist, and the root filling, of course, is his. The patient is in my care at present and I made the radiograph partly to record existing conditions, and partly for use in this discussion. Here we note even more clearly than in the other case the retention by bony union, and we learn that osteoclastic action may be so closely followed by osteoblastic that a root may be held fast though partly resorbed.

Here, again, we have a condition not entirely analogous with that to which I am specially calling your attention. We are dealing here with a non-vital root, and one which is an intruder whether replanted or implanted. Moreover, we must note that the destructive action attacks all surfaces at once, and does not begin at the apex and proceed toward the tooth crown. The osteoblastic action in one case is entirely behind the tooth root, and in the other it surrounds it. But there is another condition still, which I also regret my inability to show you, but which I hope to obtain.

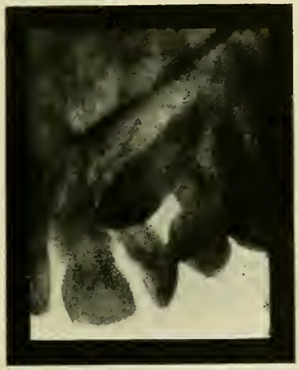

Fig. 12 (Schamberg).

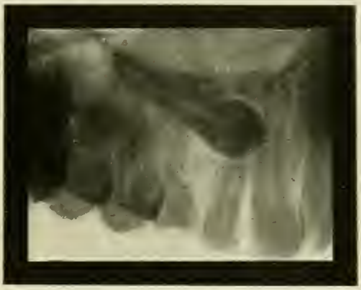

Fig. 13 (Lange).

Where an implanted or replanted tooth has once become firm, some traumatic or other cause may inaugurate a new resorptive action. This will have its origin at the apex of the root and will proceed toward the crown exactly as we see the deciduous teeth resorb, until finally it is held so slightly that it is loosened and is either exfoliated or extracted. It would be interesting to have pictures of such teeth and note the appearance of the surrounding bone during this destructive action.

Problematic Influences of Erupting Teeth.

Coming back to our original problem, we must ask ourselves "what has caused the resorption of the roots of the four incisors?" It would relieve us immensely, could we be sure that the advancing cuspids have inaugurated the trouble, but we have objections to meet with this hypothesis. One is that in similar conditions in the third molar region the pulps die; a second is that we see so many similar conditions without resorption of the permanent teeth that are in the paths of those erupting abnormally, that we would be compelled to explain the further problem, "why does the advancing cuspid cause resorption in some cases and not in others?" Lastly, and more important, I will presently show you similar resorptions where the permanent cuspid is congenitally absent.

Fig. 12 is an excellent radiograph, in which we see a malposed cuspid erupting without damage to the permanent teeth, since we see the outlines of the lateral and central roots showing through the shadows of the cuspid.

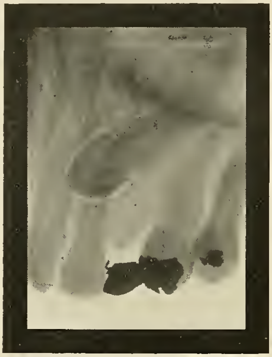

Fig. 14 (Lange).

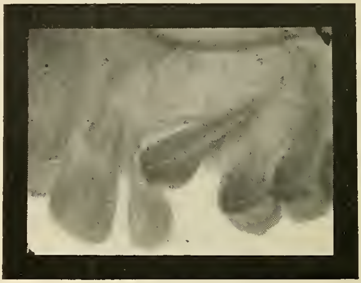

Fig. 15 (Lange).

Fig. 13 is a similar condition. As touching on another phase of this subject to which I have yet to come, please observe that the root of the deciduous cuspid is almost completely resorbed, despite the fact that the cuspid is quite distant and advancing in another direction, whereas the lateral and central which appear in its path are intact.

Fig. 14. A similar case also shows no injury to the lateral.

Fig. 15 is of the same character.

Fig. 16, supplied by Dr. Schamberg, is somewhat different. The cuspid is approaching in a fairly normal manner except that it is mesial of normal: the root of the temporary cuspid is somewhat resorbed so that if the advancing cuspid has the power to resorb a tooth root we may question why it has apparently been deflected from its path, when it should have destroyed the temporary cuspid root and taken its proper place? We again note that the lateral which is in the path of the cuspid is intact, but the apex of the central shows trouble of some character Here, however, if I read signs aright the resorption, if any exists, is clearly pathological, the alveolus being involved. However, the radiograph is not very good and a diagnosis in regard to the central is not dependable.

In regard to Fig. 17, however, we have no doubt. I regret that I do not have the history of this case, also from Dr. Schamberg, but whatever it be, here we note the reverse of Fig. 13. Here, once more, the deciduous cuspid root has resorbed, although distant from the path of the cuspid. The cuspid seems to have completely ignored the lateral root in passing, whereas the root of the central has totally disappeared. It is just as difficult to explain why the lateral has escaped, as to declare that the central has been destroyed by the cuspid. These be two horns of a dilemma.

Thus we find that though the resorption of the roots of the four teeth in the case first presented might naturally be considered as pathological, nevertheless there is a closer analogy to the resorption of the roots of deciduous teeth, which, of course, is a physiological occurrence. Thus it will not be amiss to spend some time in considering the resorption of deciduous roots.

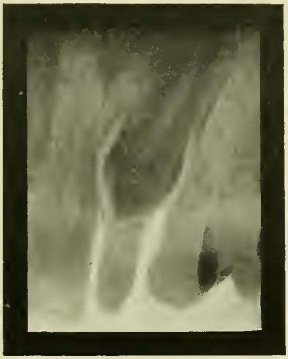

Fig. 16 (Schamberg).

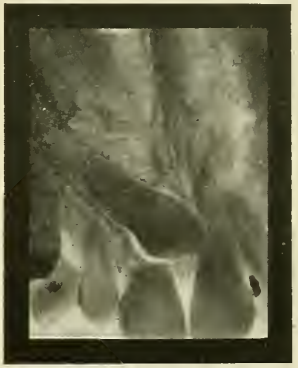

Fig. 17 (Schamberg).

Resorption of Roots of Deciduous Teeth.

Here we have a normal and constantly recurring sequence of events, which has undoubtedly been studied by many histologists, but we do not find that the scientific gentlemen have as yet arrived at a single and definite explanation of all the phenomena. Perhaps the most widely adopted theory is to the effect that the oncoming permanent tooth is in some way a factor, or cause of the resorption. In regard to the details of this there is a variance of views, some believing that the advancing tooth, or tooth sac, causes pressure which inaugurates the resorption. One argument is to the effect that the resorption of the deciduous tooth will start at the point nearest to the advancing tooth and that it will proceed in the direction of the long axis of the path of the oncomer. Pictures which I will show fit this view very well, but they

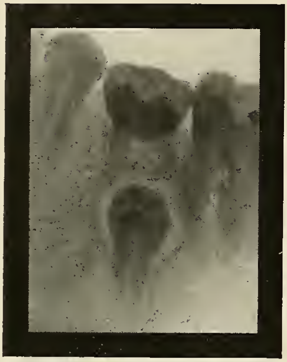

Fig. 18 (Schamberg).

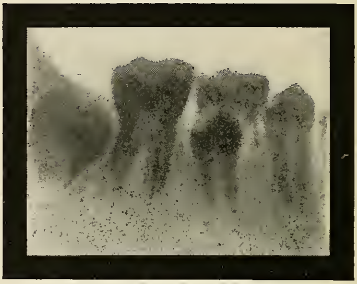

Fig. 19 (Van Woert).

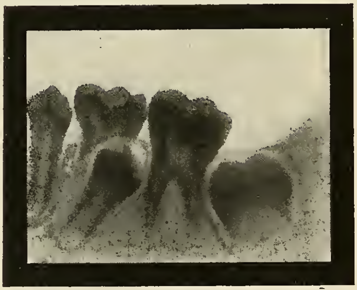

Fig. 20 (Van Woert).

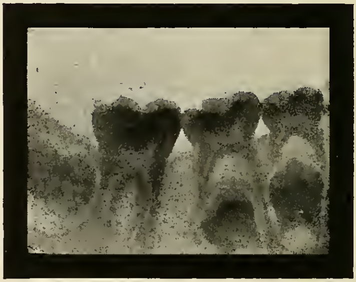

Fig. 21 (Lange).

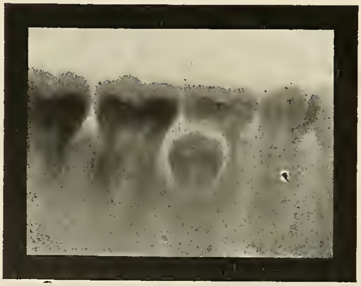

Fig. 22 (Lange).

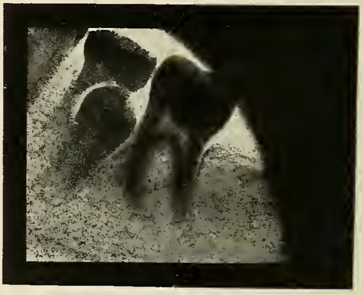

Fig. 23 (Schamberg).

fit equally well with quite an opposite theory, which is that the part of the deciduous root which resists resorption deflects and so alters the direction of approach of the erupting tooth. Another view is to the effect that the sac of the erupting tooth generates a "resorptive organ" which is the destroying agent. Were this true we could understand the destruction of any root impeding the arrival of the new member, whether deciduous or permanent. But were this explanation correct we would be at a loss to comprehend such conditions as seen in the last illustration (Fig. 17), where a deciduous tooth distant from the advancing cuspid shows resorption, while the lateral incisor directly in its path has escaped, and the central incisor which it is just reaching has completely lost its root.

Fig. 18 is a perfectly normal condition. The deciduous tooth is losing its root, and the bicuspid is, as it were, arriving on time. Were this constant there would be no difficulty in solving the problem, except, indeed, that one theory would fit the facts as well as another, which, of course, would lead us no nearer to a final knowledge than we are at present.

Fig. 19 is similar and shows such a state of affairs as would result if the tooth in the last picture should continue to advance and its predecessor to resorb. At this time the roots have disappeared and the deciduous crown is about to be shed.

Fig. 20 brings us face to face with an early stage of one of our orthodontic problems. Is this deciduous root resorbed as it is because of the false direction of the bicuspid, or has the resistance to resorption, or let us say, assymetrical resorption, caused a deflection of the bicuspid? Gentlemen, this is a question of importance to us, because a knowledge of the truth would aid us mightily in deciding when to extract the deciduous tooth.

The Author's Views Upon Resorption of Deciduous Roots.

And now I shall enter upon the dangerous hazzard of expressing my own views. If the histologists all agreed upon this matter I should not venture, but since they are at variance one more theory can scarcely befog the issue much.

As the latest American work on histology is from our well-known and much-admired Dr. Fred'k Noyes, I very naturally consulted his book, hoping to obtain his views upon this subject, but in this I failed. He gives us some beautiful microscopic pictures of sections showing dentition at various stages, but unless I have overlooked it, there is nothing explaining the resorption of the deciduous roots. In speaking of the eruption of the deciduous teeth themselves, however, I find this statement:

"Usually, somewhere between the seventh and ninth months after

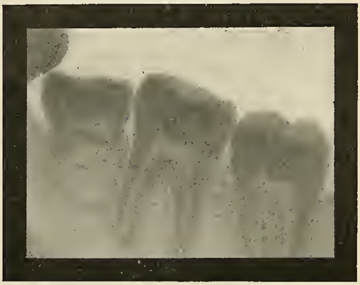

Fig. 24 (Schamberg).

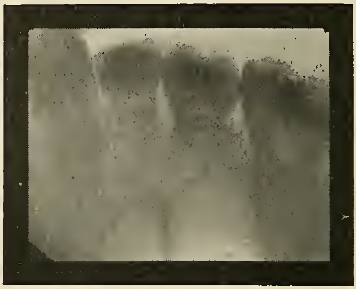

Fig. 25 (Schamberg).

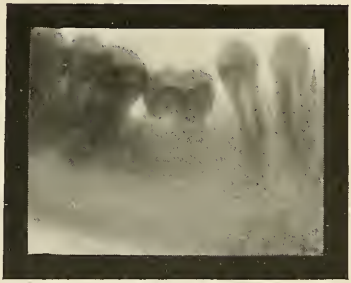

Fig. 26 (Lange).

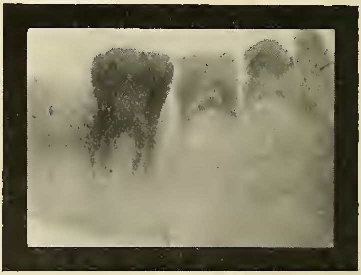

Fig. 27 (Lange).

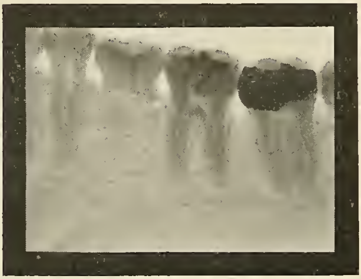

Fig. 28 (Lange).

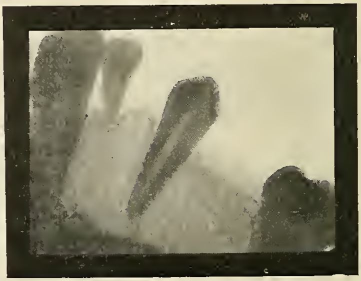

Fig. 29 (Lange).

birth, the growth of the central incisors causes the absorption of the roof of their crypts, and the tooth moves occlusally, cutting through the "soft tissues." The author does not tell us in detail how the advancing tooth absorbs the roof of its crypt, but he says it is the result of growth, and speaking of growth, elsewhere he tells us that growth creates a force, which he calls "growth force." He says that this "force" is "the result of the multiplication of cells of the tooth germ, and is exactly comparable to forces exerted by the multiplication of cells in any position." Then he continues and says: "For instance, the force exerted by the multiplication of the cells of a rootlet of a plant is sufficient to force pebbles aside and make an opening through hard-packed earth."

After this he practically tells us that all bone growth is dependent upon this "growth force."

All this is beautiful in theory, and, moreover, it may be true, and yet it does not appeal to me as logical, though I admit it may be histological. I do not mean to imply that the multiplication of cells does to create a force. This is proven by the simile of the rootlet moving earth and pebbles aside, but that the stress exerted by this force influences growth elsewhere or in adjacent tissues, does not appeal to me. Moreover, let me point out that the growing vegetable root thrusting aside pebbles is not exactly analogous with the growth of a tooth root which is surrounded by living tissues. It seems to me that these living tissues are not moved by the force of the multiplying cells of the tooth germ, but that they move or grow, as the case may be, energized by forces within, rather than without themselves, and in obedience to the mysterious law which causes all cells or aggregations of cells to aim at the production of type.

Without going into histology, or biological chemistry, which I am quite satisfied to leave to the specialists in those fields, I believe that the resorption of the roots of deciduous teeth is in no physical sense dependent upon the eruption of the successor. I believe that the resorption of the deciduous root is merely a fixed step in the normal plan. The law which governs the development of the individual demands that he shall have two sets of teeth. As stages of this routine the crowns of the deciduous teeth are formed and then their roots. In due season, these roots resorb, not because of any influence exerted by the oncoming tooth, but because they must be removed out of the way, that the advancing tooth may arrive. In other words, it is a retrogressive metamorphosis, which is just as vital to the plan, as was the original building up of the tooth. If this be true, then it would follow that in the regular order, the roots of deciduous teeth could, and often would, resorb in spite of the fact that no permanent tooth germ were underlying it, and this is exactly what does occur, as I shall abundantly show you. In support of the view that the deciduous roots are resorbed by pressure or growth force, if you wish to call it that, exerted by the oncoming tooth (I am using Dr. Noyes's expression, but he has not said this. I merely adapt his phraseology to a general belief), it has been pointed out that in a strictly normal cycle the resorption of the roots of a deciduous molar will assume the form and fit as a matrix over the bicuspid tooth. But this clinical fact quite as well fits in with my theory, and I believe that this co-adaptation is a fortuitous circumstance rather than a result consequent upon the presence of the bicuspid. Consider for a moment! Nature has ever found the best method of advancing its aims, and an important aim here is that this grinder shall be firmly fixed as long as possible. If the roots of the deciduous molars were resorbed, as are the roots of incisors, the molars would very much more quickly become loosened. But when resorption occurs as it does normally, the destruction occurring along the inner and underside of the roots, it follows that the mesial and distal surfaces of the roots may be retained longer, and the roots thus have a greater length and proportionately greater stability. I think I shall be able to show you resorption of this character, the deciduous root assuming the form of an advancing bicuspid despite the fact that no bicuspid is present.

This brings us to a different reading of the assymetrical resorption of roots. We have still to study out the chemistry of this solution of a tooth root, as well as to consider the destructive agents which are making the attack, most probably osteoclasts, before we can determine why it is that the deciduous root at times does not resorb, or resists resorption. But I leave that also to the histologists, and will merely record the clinical fact that such resistance does exist. And it is my view that when it does occur, this resistance, or persistence of the deciduous root causes a deflection of the permanent tooth. I do not, however, mean that all deflections or misplacements are traceable to this cause, for I have already shown misplaced and badly deflected cuspids, where the resorption of the deciduous teeth was normal.

Fig. 21 is a good illustration of possibilities. The first deciduous molar is resorbing normally, and the bicuspid is arriving normally. The resorption of the second molar is quite normal and symmetrical and yet the bicuspid is arriving abnormally.

In Fig. 22 the picture is quite different. The mesial root of the temporary molar has persisted, and consequently the bicuspid is erupting distal of normal. In this instance it is possible that the distal root of the deciduous molar was also resistant of the resorbtive agent, or else

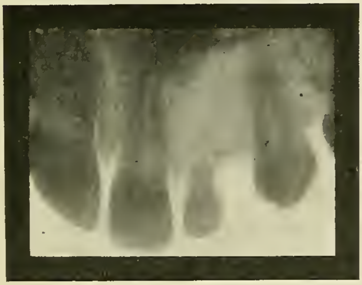

Fig. 30 (Lange).

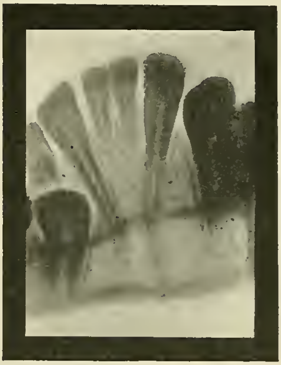

Fig. 31 (Lange).

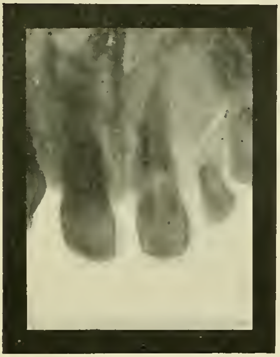

Fig. 32 (Schamberg).

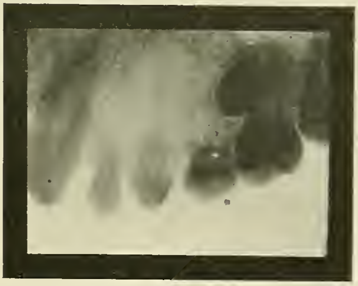

Fig. 33 (Schamberg).

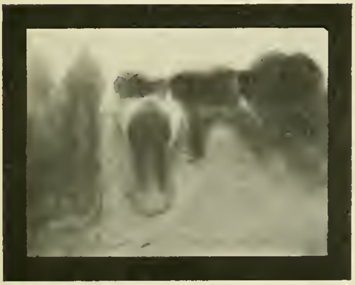

Fig. 34 (Schamberg).

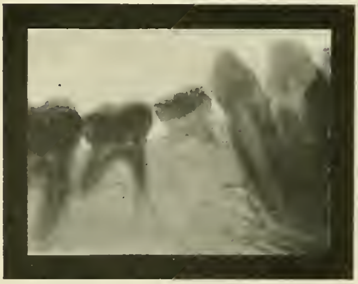

Fig. 35 (Schamberg).

the agents themselves were inactive, for note here that the bicuspid is still unerrupted, whereas the second permanent molar is in place.

Fig. 23 is practically a duplicate of the last in regard to the bicuspid and the deciduous molar, but here, curiously enough, the second permanent molar appears to be entirely absent. If the tooth has been extracted, it would fix the condition at almost the same period as in the last case. At all events, it shows that such conditions are not uncommon.

Deciduous Roots Resorbed Without Successors.

I said that I could show you cases of resorption of deciduous roots in the absence of permanent successors, and I will now present that evidence.

Fig. 24 shows a deciduous second molar typically resorbed, with no bicuspid present.

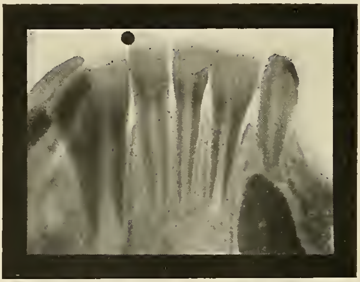

Fig. 36 (Lange)

Fig. 25 shows two deciduous molars with roots resorbed, and neither of the bicuspids present.

Fig. 26 shows a deciduous molar resorbed almost to the point of shedding, with no successor.

Fig. 27 shows two deciduous molars with roots resorbed, and no bicuspids present.

Fig. 28. Deciduous molar with roots resorbed and no bicuspid present. I would have you note that this condition seems more often occurring in connection with the second deciduous molar than with the others, at least so far as I have been able to collect radiographs. This condition occurs elsewhere, however, as I shall show.

Fig. 29 shows an upper temporary lateral, resorbed with no permanent lateral present.

Fig. 30 shows another deciduous lateral with root resorbed and no permanent lateral present.

Fig. 31 shows two deciduous lower centrals with roots resorbing and no permanent centrals present. The cuspid region, however, exhibits normal conditions.

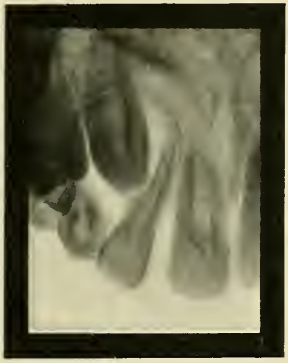

Fig. 37 (Schamberg).

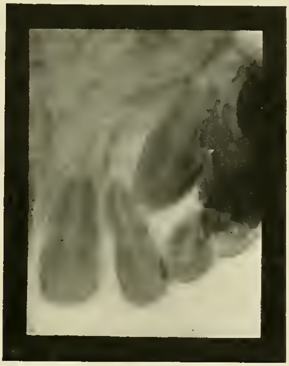

Fig. 38 (Schamberg).

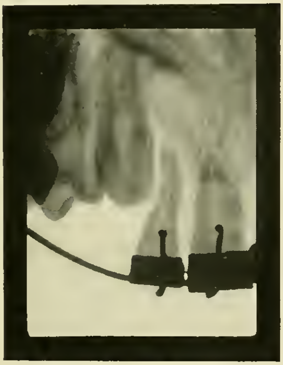

Fig. 39 (Schamberg).

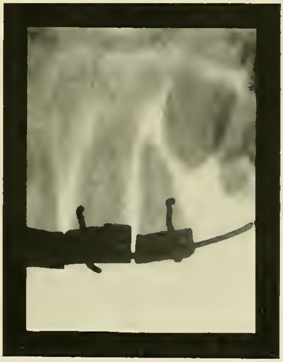

Fig. 40 (Schamberg).

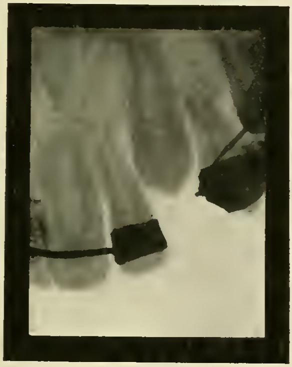

Fig. 41 (Schamberg).

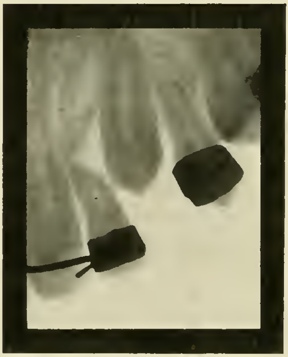

Fig. 42 (Schamberg).

I will show you now illustrations of a case occurring in my own practice.

Fig. 32 shows the right side in the upper arch and we see the deciduous lateral with root resorbing and no permanent lateral present.

Fig. 33 shows the left side of upper arch of same patient, and we see the deciduous lateral incisor, cuspid and first molar all with the roots resorbed and no permanent successors present.

Fig. 34 is the right side of lower arch of same patient. Conditions are progressing normally in the region of the first bicuspid, but once more we find the second deciduous molar resorbed and no permanent tooth below it.

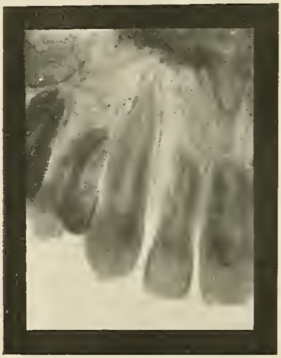

Fig. 43 (Schamberg).

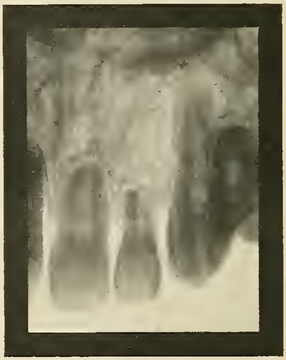

Fig. 44 (Schamberg).

Fig. 35 is the left lower side of same patient, and now we have both bicuspids absent, yet both deciduous molars are resorbed typically.

I mentioned heretofore that it is possible that resorption of the deciduous tooth may not occur even though the permanent tooth be present. This is exactly the reverse of the conditions which I have been showing, but is an argument in the same direction as it is opposed to the theory that the advancing permanent tooth causes destruction of the tooth which may be an obstacle in its path.

Fig. 36 is an excellent example. Here we note the deciduous cuspid with root untouched by resorption, while the sac of the advancing cuspid is in contact with it.

Views of Dr. Broomell.

In outlying my own theory of the resorption of deciduous tooth roots I avoided the histological explanation thereof, but I can give you the opinion of one well-known histologist, Dr. Broomell, whose views are not contradictory of my own, though more scientific in supplying detail. I merely state the belief that the resorption of the deciduous tooth roots is not dependent upon any excitation from the permanent successor, and I offer radiographic proof of clinical facts which substantiate this contention. But, unless I misundertood him (his views were communicated to me orally), he believes that at the opportune time there appears at the apex of each deciduous tooth root what may be called a "resorptive organ," whose office it is to destroy the root, and thus clear a way for the permanent tooth. If this can be demonstrated, then perhaps we may be able to account for the resorptions recorded in connection with the first case, as well as with those that are to follow, which, be it remembered, show more clinical resemblances to the physiological resorptions of deciduous roots than to any of the pathological resorptions which I have described, because the pulps remain living and the alveolus is rebuilt behind the resorption.

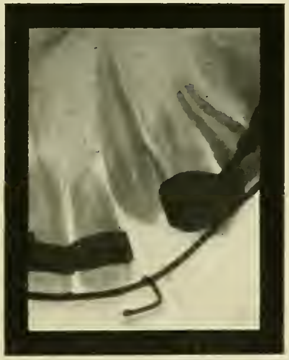
Fig. 45 (Schamberg).

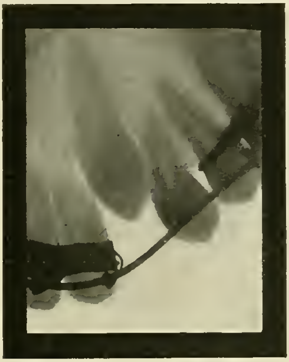
Fig. 46 (Schamberg).

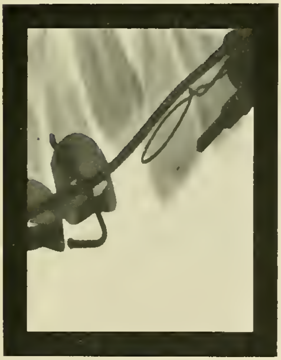
Fig. 47 (Schamberg).

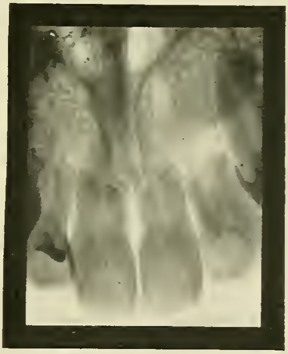
Fig. 48 (Schamberg).

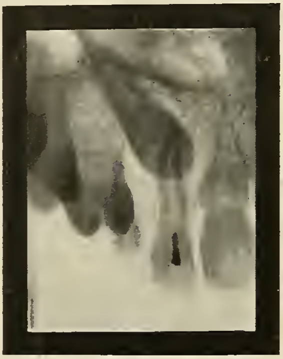

Fig. 49 (Schamberg).

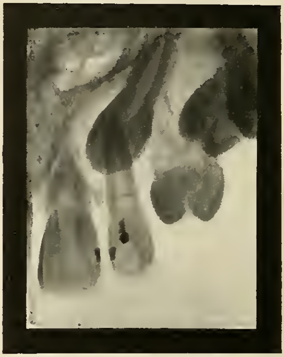

Fig. 50 (Schamberg).

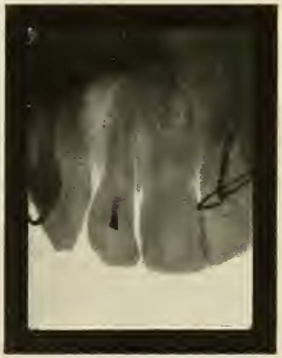

Fig. 51 (Ottolengui).

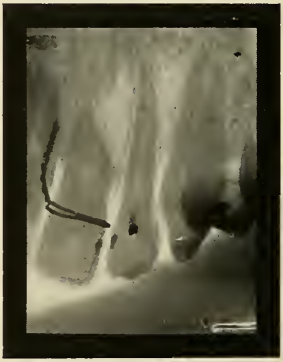

Fig. 52 (Ottolengui).

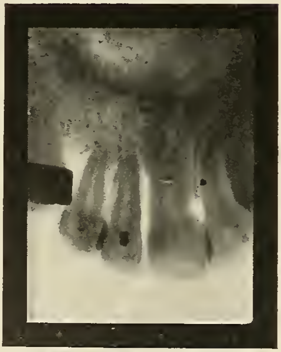

Fig. 53 (Ottolengui).

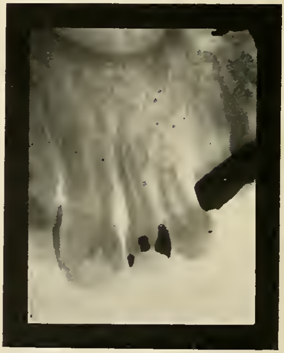

Fig. 54 (Ottolengui).

Normally man is supposed to have but two sets of teeth, but in sporadic cases we find additional or extra teeth erupting. If it be true that the deciduous teeth are resorbed by a resorptive organ which appears at the apex of the root, is it not within the realm of possibility that a similar condition might occur, as an eccentric act of nature, at the apex of a permanent tooth?

I advance this postulate, but I cannot say that I am quite prepared to adopt it. If my own case were the only one of its kind, I might do so, but, unfortunately, I have found others.

I will now present the radiographic records of four cases, occurring in the practices of Drs. Young and Kemple, and I would like those gentlemen to give us the clinical histories of their cases. The first case, Master B., is a patient of Dr. J. Lowe Young.

Fig. 37 shows the upper right side. The cuspid is seen erupting. The root of the temporary cuspid has resorbed, and we note that there are signs of resorption of the permanent lateral. In this instance the picture is quite like that of traumatic resorption, as the destruction has not involved the apex, but seems to have occurred just in line of the advancing cuspid. I believe, however, that this pulp has remained alive, and this would not be the expectation if the resorption were strictly pathologic. Nevertheless, there is room for argument here. But observe that the apex of the central appears to be affected.

Fig. 38 shows the left side of same case. The lateral root is as yet unaffected, but the central has much the appearance of its mate. These two radiographs were made November 29, 1909. Interference was instituted and radiographs taken February 15, 1910, only forty-seven days later.

Fig. 39 shows the changed position of the teeth on the right side and no noticeable difference in the appearance of the affected roots.

Fig. 40, however, of the left side discloses that the apex of the lateral incisor has been considerably shortened The next radiographs were made on October 12, 1910.

Fig. 41 shows the cuspid erupting nicely, with the lateral and central about as before.

Fig. 42 shows the left side, taken at the same time. The final radiographs were made on June 12, 1912.

Fig. 43 shows the right side, with new bone apparently built into the resorbed portion of the lateral root.

Fig. 44 shows the left side. Candor compels me to point out that there is no certainty that the central incisor roots have been resorbed. They do not appear normal, but, then, perhaps they never have been normal. We know, however, that the lateral incisor roots have suffered.

and it is possible that in this case the resorption of the laterals has been due entirely to the advance of the cuspids, yet it is strange that the pulps should have remained alive.

The next case, Miss C., is also a patient of Dr. Young's.

Fig. 45, from a radiograph made October 26, 1909, shows the left side of the upper arch, and we see a cuspid crowding into place. Apparently there has already been some resorption of the lateral incisor.

Fig. 46 shows the condition on January 11, 1910.

Fig. 47 shows the appearance on March 18, 1910.

Fig. 48. On February 6, 1911, a radiograph was taken which, I am sure, will surprise you. It is seen in Fig. 48, where we note a distinct resorption of the four upper incisor and roots.

I admitted that the previous case might have been purely traumatic and restricted to the laterals, yet here, where the lateral suffered less than in the previous case, the depradation is much greater, almost as bad as in the case of my own patient.

The next case was a patient of Dr. Kemple's, and discloses rather extraordinary conditions. I am sure that some of those present are saying to themselves, "Of course, the cuspids did it." But please note the last two cases I have to present. The first radiographs were made January 24, 1910.

Fig. 49 shows the right side with a cuspid erupting. The lateral root is seen to be intact, but the central seems to be resorbing.

Fig. 50 shows the left side in very similar condition. The last radiographs were taken April 13, 1913, and appear in the next two illustrations.

Fig. 51 shows the right side with cuspid brought into position, but the root of the central incisor is badly resorbed, the lateral, however, being still intact.

Fig. 52 shows the left side, which is quite similar. The last case which I have to show you is rather unique. I do not know the clinical history. The illustrations are not as good as I would like, but the patient lived out of town and we have not been able to get another sitting. One point of peculiar interest is that the cuspids being congenitally absent, can hardly be the mischief makers in this instance.

Fig. 53 shows the right side. It is evident that there is no permanent cuspid. We note the temporary cuspid present and not resorbed, though the resorption of the alveolus about this tooth and the lateral as well, seems to leave them with very little bony attachment. But the central either has lost its apex or else never had one.

Fig. 54 shows the left side. Here we see resorption of the apices of the deciduous cuspid, the permanent lateral and the central. Yet there is no permanent cuspid.

Gentlemen, I trust that this rather hastily compiled record of radiographic data may result in inspiring some brighter and more scientific mind to take up these problems for us.

Discussion of the Paper by Dr. R. Ottolengui.

Dr. F. G. Kemple, New York.

The radiographs shown by Dr. Ottolengui seem to open up a new field of difficulty and complication and study, not only for the orthodontist, but also for the physiologist and the pathologist. Just what causes the roots of the deciduous teeth to absorb, I believe is still an unsolved problem in physiology, but we recognize it as a normal physiological process and have, therefore, been content to answer the question in this manner. But the absorption of the roots of permanent teeth, which are to all appearances perfectly healthy, is a phase of the subject that has not been very deeply studied, or at least it has not been discussed in dental literature. It is this phase of the subject that so vitally interests the orthodontist, and I hope that Dr. Ottolengui and others will continue to study and discuss this question from year to year until a satisfactory solution of the question has been reached.

When an orthodontist discovers a beautifully developed permanent tooth, strong and of good structure, becoming very loose—apparently almost ready to drop out of its socket—he is suddenly seized with something very akin to heart-failure.

The first case of mine shown by the essayist was that of a boy past thirteen years of age, who was slow in erupting his teeth. At this age he still retained three lower deciduous molars and an upper deciduous cuspid. The upper molars and bicuspids had drifted forward and had reduced the space for the permanent cuspids to about one-half the required amount. The first radiographs showed the permanent upper canines to be directed mesially with their crowns lying over the labial surface of the ends of the roots of the permanent laterals, pressing the roots of the laterals in a lingual direction and causing their crowns to be tipped forward. The central incisors occupied a normal vertical position. These radiographs were made for the purpose of locating the permanent cuspids, and neither the radiographer nor myself noted any resorption or apparent non-development of the roots of the central incisors. I supposed the radiograph had been taken at an angle that did not show the full length of the root of the centrals. In the treatment the centrals were disturbed very little, almost all of the force being exerted to move the molars and bicuspids distally. About eight or ten months after I started treatment, the upper central incisors became very loose, so loose that I feared they would be lost. I immediately had other radiographs made, but these did not show, apparently, any more resorption of the roots of the centrals than did those that were made ten months before, but they did show a closer encroachment of the crowns of the cuspids on the roots of the centrals. This gradual encroachment of the crowns of the cuspids on the roots of the centrals, and the extreme looseness of the centrals made it seem imperative that the cuspids should be moved away from the roots of the centrals. An incision was made through the gum, the outer plate of the alveolar process was cut away and the crowns of the cuspids were exposed; small hooks were cemented in the crowns of the cuspids and elastic ligatures were applied to force the eruption of these teeth and to draw them away from the absorbing roots of the centrals. After this operation the centrals very soon became firm in their sockets, and radiographs made by Dr. Ottolengui two and a half years later show no increase in the resorption of their roots. It is needless to say that these teeth were not disturbed in any way during the remainder of the treatment.

The second case of mine which the essayist showed is not quite a fair example to submit, if we are examining normal conditions. The patient, male, nineteen years of age, underdeveloped both physically and mentally; all of the lower teeth and nearly all of the upper were badly affected with pyorrhea, and the two upper permanent cuspids were congenitally missing. Such a condition can hardly be regarded as normal.

The essayist has shown cases where the roots of deciduous molars were resorbed when there were no apparent successors present. This would indicate that the force of the erupting permanent tooth is not the only factor in causing the resorption of the root of the deciduous tooth. He could also have shown any number of cases where the roots of deciduous teeth were not resorbed when there were no permanent successors present, as well as showing, as he did, other cases where the roots of these teeth were not resorbed when the permanent successors were present. This might indicate that root resorption is entirely independent of the pressure from another erupting tooth. If this be true, it is important that we learn as soon as possible what are the active elements in root resorption, and whether or not they can be controlled.

All of these questions of congenitally missing teeth, root resorption, malocclusion in about ninety-eight per cent. of the human mouths of civilized peoples, pyorrhea and caries, lead me more strongly to the belief that the human denture is undergoing a retrogressive evolutionary change that may be more rapid than we suspect; and while these changes are taking place there is no law except the law of variation to account for these different conditions. Unless some means be found by which the original function of the dental organs can be restored, dentistry cannot hope to hold in check the growing tendency toward such conditions as those with which we are trying to battle.

Dr. Martin Dewey, Kansas City. This question of the physiologic and pathologic resorption of the roots of teeth is a very interesting one, and after everything we know has been said, there is much more yet to be said. Dr. Ottolengui has opened up a problem that will have to be approached from several different views. As regards the cause of resorption of the deciduous teeth, Dr. Ottolengui quotes from Noyes very correctly, but he misinterprets him. He says the advancing permanent teeth cause resorption of the deciduous teeth.

Dr. Ottolengui. No, I did not.

Dr. Dewey. The theory is held that the advancing permanent teeth does have something to do with the resorption of the deciduous teeth. It is not permanent pressure that causes the resorption of the deciduous teeth. If the crowns of the permanent teeth ever touch the roots of the deciduous teeth resorption stops in that area. Why? Because there is not tissue between the roots of the teeth and crown. The organ which causes resorption of the roots of the teeth, whether physiological or pathological, is the osteoclast. I do not believe, as Broomell does, that there is a special resorption organ. I do not believe there is any special organ or development of organs, or development of cells that causes resorption of the deciduous teeth. The osteoclasts are there all the time, but conditions must be brought about to cause them to work.

There are two general constitutional conditions which materially affect the resorption and non-resorption of roots of teeth. These are tuberculosis and rickets. Rickets present a clinical picture which cannot be misinterpreted, but it has been overlooked.

Several years ago I was referred to a series of articles and monographs by Dr. Hertzler, professor of surgery in the University of Kansas on these two particular diseases, written by Dr. Jenner, who was professor of diseases of children in London. He wrote these monographs on rickets, tuberculosis and abdominal tumors. In rickets, as far as dentition is concerned, the first thing that occurs is a tardy eruption of the deciduous teeth. The first deciduous tooth will not make its appearance as early as it should. Finally, when it makes its appearance, the next thing that occurs is its early loss. The reason it is lost early is because of imperfect calcification of the roots. If the child has a rickety diathesis, the roots will be faultily calcified, and the roots of the first permanent molar will be calcified to a great extent sooner than the lateral. The root of the deciduous cuspid being the last tooth to be calcified in the deciduous set, necessarily it occupies a close relation to the time of calcification of a portion of the permanent incisor. So in the cases in which Dr. Ottolengui shows where the root of the permanent central is resorbed and the roots of the cuspid and lateral are not resorbed, there is a difference in resorption because of the difference in the time of calcification. There is imperfect calcification of the roots of the central, but not of the lateral.

In tuberculosis you have just the reverse. Teeth erupt on time. Deciduous teeth make their appearance at the proper time, but are not lost at the proper time. The root is not resorbed because, in my mind, the osteoclast is simply a specialized leucocyte. The leucocytes, especially in cases of tuberculosis, are extremely busy. They have more important work to do than the resorption of the roots of the deciduous teeth. Tuberculosis does not interfere with the eruption of the teeth nor with calcification. A permanent tooth calcifies just the same. It meets with opposition and is deflected.

Children with tuberculosis are mentally equal to or above the normal; they have fair skins, good red cheeks and they have the entire clinical picture which goes with tuberculosis. These are the cases in which the teeth resorb slowly. In rickets the bones are large, the wrist joints are large. There is a thickening of the epiphyseal cartilage. The upper arches are badly contracted. As a result of that, these two constitutional diseases are responsible, in a large measure, and are causes, of why in one case the roots of the teeth are resorbed, while in other cases they are not.

As to the pathologic resorption of the teeth, that is a little different, because necrosis accomplishes it, and you will have necrosis of tissue around that neighborhood, and you do not have the rebuilding of the bone as in the case of resorption of the roots of the teeth which Dr. Ottolengui shows. There is resorption of the alveolar process around the roots of the tooth. The osteoblasts rebuild the bone. The root of the tooth is missing and does not rebuild because the dentine papillæ has completed its work and is never reformed.

Dr. Federspiel. Is there a decrease or increase in the leucocytes?

Dr. Dewey. An increase. The osteoclast is a specialized leucocyte, and the leucocytes are busy somewhere else. Cure a case of tuberculosis and resorption of the roots of the deciduous tooth will take place. I do not think moving the teeth have been responsible for the resorption of the roots of these teeth. We must go back further than that in searching for the cause. The cause may have been in faulty calcification of the roots in the beginning. Roots of permanent teeth have been resorbed that have never been moved.

Dr. Ottolengui has cited cases confined to the incisors. He has related cases confined to the centrals, and not laterals. There were cases in which he found the central root was not resorbed, but the lateral was affected, again because of the difference in the time of calcification and conditions which were present at the time the teeth were calcifying.

In the presence of a certain constitutional condition there is faulty calcification of the root and bone around the root; then when the constitutional conditions become fully normal, and the rickety diathesis disappears the osteoblasts produces the development of bone at the end of the tooth. The pulp has nothing to do with the resorption of the tooth. We have never demonstrated that an osteoclast was ever present in a pulp. Resorption always occurs, or osteoclasts are found in the region which has to do with the peridental membrane. The osteoclasts resorb the roots of the teeth gradually. The blood vessels are not disturbed, consequently the pulp is not disturbed, and following resorption there is rebuilding of normal bone. I do not know but that it would be interesting to find out in these cases whether the resorption stops or progresses until the whole tooth is lost. If the whole root were faultily calcified, the whole root of tooth would probably absorb. When we got down to normal dentine the resorption would stop. Bone would build around there, because the osteoblasts being present, normal development of bone would take place just the same as we would have it in physiologic resorption of deciduous teeth.

Resorption of the roots of the deciduous teeth is a strange thing. The part of a deciduous tooth that is first resorbed is not always that portion close to the permanent teeth. You will find areas of resorption on the side of the tooth. There will be certain areas of resorption at different places. There will be an area cut out of the cementum and the dentine, and then the cementum built over again, and that tooth will be patched in that particular region. The apex in the area of resorption will grow, will build in, and the fibers will become attached; the roots and the tooth cut off and built on again to give a nice masticating apparatus.

In those cases Dr. Ottolengui cites, resorption of the root does not occur in the whole broad surface at one particular time, but a portion is cut off, and then probably cementum is laid down and dentine is cut off until we get down to normal dentine, and then it builds over and stays there without any further resorption. The reason a central incisor becomes resorbed and not a lateral is due to imperfect calcification of one and perfect calcification of the other.

It is well to pay more attention to constitutional conditions as being the etiologic factors in resorption and non-resorption of the roots of teeth than to consider all these teeth as being alike. They are not all alike. If the teeth that were resorbed were abnormal, I do not think the moving of them had anything to do with it. The reason we have a dead pulp in pathologic resorption in tumors and abscesses is because we have other pathologic conditions besides those in the cases which Dr. Ottolengui has related.

Dr. J. Lowe Young, New York City.

I am very glad we have had this paper by Dr. Ottolengui, as I have had some cases in which there has been resorption of the roots of the permanent teeth and with the permission of the Chair I will describe these cases, for I am sure the essayist wishes to get all the evidence possible regarding such phenomena.

Before describing the cases in which resorption was found I would like to describe another case, because with our present knowledge I would consider it criminal to treat such a case in the way I treated it at the time, which was several years before I ever heard of or saw any evidence of resorption of the roots of the permanent teeth.

Case I.

Case I, was that of a boy twelve years of age. His upper incisors were very much separated and the roots converged, and the radiograph shows that the unerupted cuspids appeared to be pressing the lateral roots against the central roots. I constructed an appliance so as to force the roots of the lateral incisors against the crowns of the unerupted cuspids with the hope of moving them distally, and I did it to such an extent that one of the cuspids was a little too far when erupted. As far as I know there was no resorption in this case, but I did not have a second radiograph taken. I wish to repeat that I would not think of such a method of treatment now.

Case II.

A case of a young lady with an impacted upper cuspid on one side, the lateral in contact with the first bicuspid, was referred to me by a dentist who had been associated with the dentist that cared for the teeth of this young lady's mother. After I procured models the dentist called on me, and when I told him what I intended to do, he said: "I am afraid to have anything done for this young lady. They are personal friends of mine, and the mother of that child has lost her four upper incisors due, we think, to the regulation of her teeth by means of rubber plates. The roots resorbed, and the four incisor crowns dropped out.

I would not have this girl's teeth lost for anything." I said to him, "you need not be alarmed about that," and without any radiograph I opened up space enough for the cuspid which, apparently, was quite ready to erupt; but as it did not put in appearance as soon as I thought it should, I had a radiograph made, and then, to my surprise, I saw the condition of her incisors. I retained the case and waited for the cuspid to erupt and the incisor roots to move forward, as this case was treated with an expansion arch and ligatures. After *several months* the cuspid began to erupt and the incisors that had been rotated drifted back a little and the roots did not move forward.

After Dr. Angle showed me his new appliance, I was tempted to apply it to this case, but before doing it I had another radiograph taken which showed that the roots were no better, but possibly a little worse, so I decided to let them alone, as the cuspid had then about erupted to the point where it touched the lower teeth. I have not seen this young lady in a year and a half, but when last seen, her incisors were firm. I saw this patient's dentist April 1, 1914, and he had seen the young lady very recently and he reported her teeth in fine condition.

Case III. Figs. 37 and 38 show radiographs of the unerupted upper cuspids of a boy twelve years old. On the one side you will observe the area of resorption was not on the end of the root, but on the side of the root and on the other lateral there is very little resorption on the end of the root. You will also observe that the four incisors are quite separated or fan-shape. The appliance used in this case was so constructed that the roots of the incisors would not be carried apart and thus press on the unerupted cuspids, but the crowns of the incisors would be moved toward the median line and thus brought in contact, hoping in this way to prevent further resorption. Figs 43 and 44 show radiographs after treatment and in them you will observe that the lateral on which there was resorption on the side of the root got no worse; the other lateral on which there was slight resorption at the end of the root got very much worse. While these teeth were a little loose, they were never alarmingly so. The incisors were retained by bands on the laterals with a lingual wire soldered to them, but after six months the laterals were found to be as loose as when put on. It was decided to remove this retainer and band the centrals with a lingual wire soldered to them and extending distally to each lateral and thus prevent the incisors separating, but permitting a freer movement of these teeth when in use, and I am pleased to say they soon became quite firm and, as far as I know, are all right now.

I was very much pleased with Dr. Dewey's discussion. There is one point I would like to have had him speak about, that is if he can throw any light on the apparent resorption of the side of that one root. It could not be due to imperfect calcification on the side of the root.

Dr. Monroe. Was there any rickets or tuberculosis in the mother's case in Case II?

Dr. Young. No. The grandmother of this child lived to be eighty-six years of age, and the mother was wonderfully well developed, and so was the girl. She was a splendidly developed girl and large for her age. Her mother was a very large woman. The father I never saw and do not know what kind of teeth he had.

In Case III the father was a large, healthy looking man, but the mother rather frail. The boy, while well developed mentally and above average in size, seemed below par physically.

Dr. Ottolengui. (Closing the discussion): I want to call attention to one point I did not think of when writing the paper, and that is, in both of my own cases, and in one of Dr. Young's, and one of Dr. Kemple's we had to deal with what might take place on both sides. In Dr. Young's case the maleruption was only on one side, and yet all four teeth were cut off. It is hard to comprehend that one erupting cuspid caused a disturbance which went right across and cut off the roots of four teeth.

To come back to my own cases for a moment, I would report the fact that this child was once a mouth-breather. In my view a child may be a mouth-breather and yet not be emaciated. Fat may be a result of faulty metabolism, which may be accentuated by faulty breathing. This child was a mouth-breather, and had had adenoid growths removed. She was a fat child. You will observe there was a lapse of one year and one-half in the course of treatment, and one of the reasons for that lapse, was that she developed an acute Bright's disease.

Bone Development as a Result of Mechanical Force. Report on Further Treatment in Attempting the Opening of the Intermaxillary Suture in Animals.

By Martin Dewey, D.D.S., Kansas City, Mo.
Read before the American Society of Orthodontists, Chicago, 1913.

The question of bone development as a result of mechanical force, and the opening of the intermaxillary suture, like some other questions, have been before this society a number of years. It will also be a number of more years before it will be satisfactorily settled to all.

This slide (Figs. 1 and 2) shows the relation of the bone development to the tooth germ, and the intimate relation which exists between the tooth germ and calcification bears out the fact that bone develops wherever a tooth erupts. The theory has been advanced at various times of the possibility of moving the teeth so far that you move them beyond their osseous support. That is a condition which is not very liable to happen, and which I have been enabled to produce experimentally, because I have moved the teeth over the width of the alveolar ridge. I have moved a single tooth, and immediately after movement there was as much bone on the outside (labial side) of it as there was before it was moved.

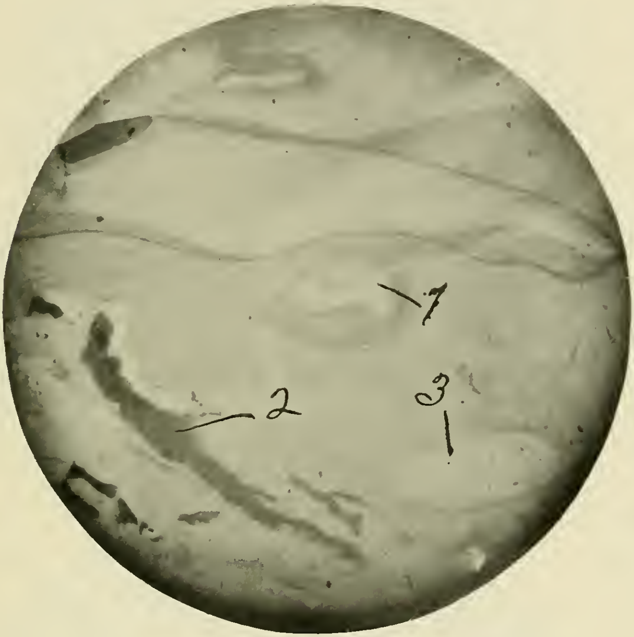

Fig. 1. (1) Tooth Germ. (2) Bone. (3) Meckel's Cartilage.

This next slide shows the manner in which bone develops (Figs. 3 and 4). You see arranged the spicule of bone, and around it the osteoblasts, which are not far removed from the bone. These spicules of intermembraneous bone are thrown out into the connective tissue. The osteoblasts continue to develop bone, and the direction which the development takes depends upon the force exerted on the growing parts.

In the development of the bones (Fig. 5) in the region of the sutures, the bone grows toward the suture, but does not unite by a boney union on the right and left sides. Sections of adults show connective tissue between the two halves of the bone. In moving the bones apart, the osteoblasts from the pre-existing bone fills in the space made by the movement.

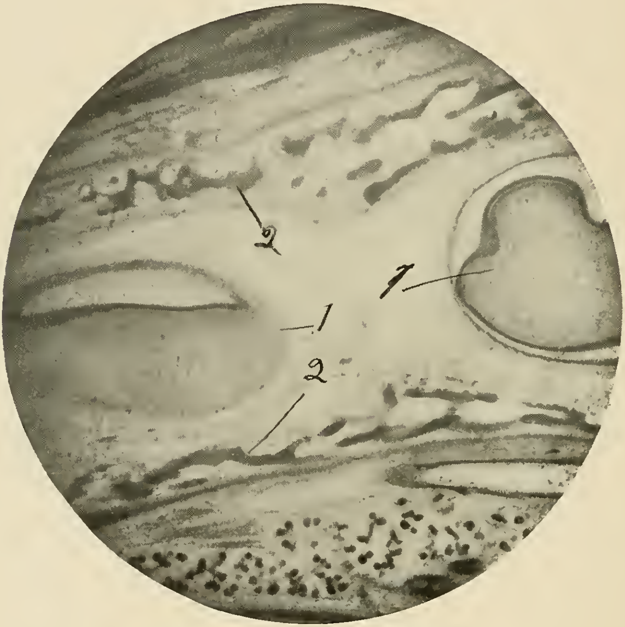

Fig. 2. (1) Tooth Germ. (2) Bone.

The growth of the bone as related to the development of the teeth is shown, and the alveolar wall grows up along the side of the tooth, and you have one island of bone piled upon the other (Fig. 6). You have osteoblasts on the outside of the bone, which builds the bone as the tooth pushes forward (Fig. 7). Taking another section we see how the character of the bone has changed, and instead of compact bone we now have cancelleous bone with large medulary spaces in it (Fig. 8). Great areas of absorption occur, and as you go farther down, at the bottom, you get development of the muscle which is attached to this side, and this dense area as it builds out will be cut out by absorption and large spaces develop (Fig. 9).

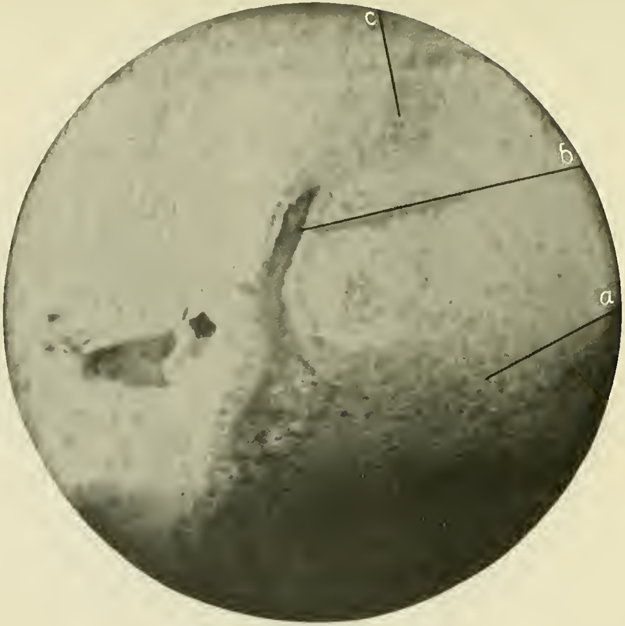

Fig. 3.

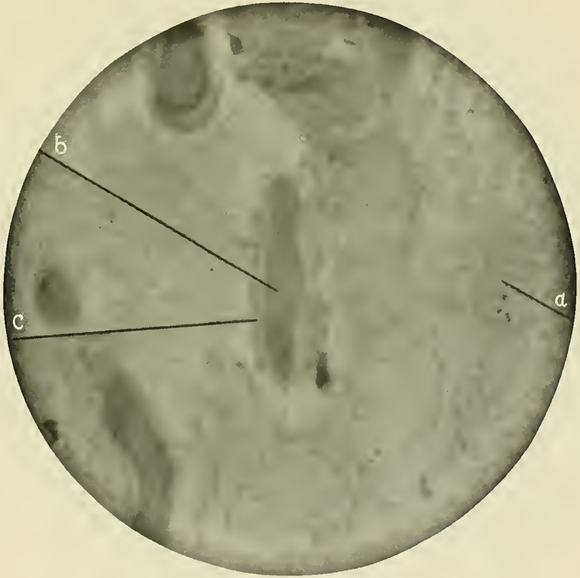

Fig. 4.

Fig. 3. "Intra-membranous bone formation."
Fig. 4. "Intra-membranous development of bone."

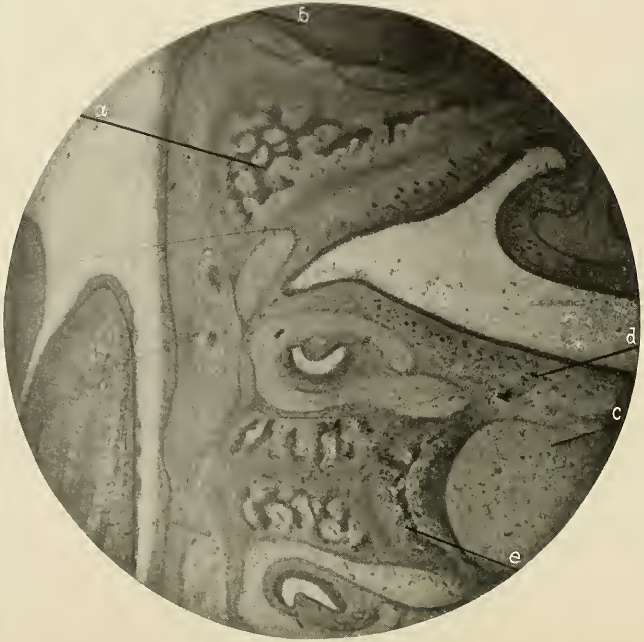

Fig. 5.

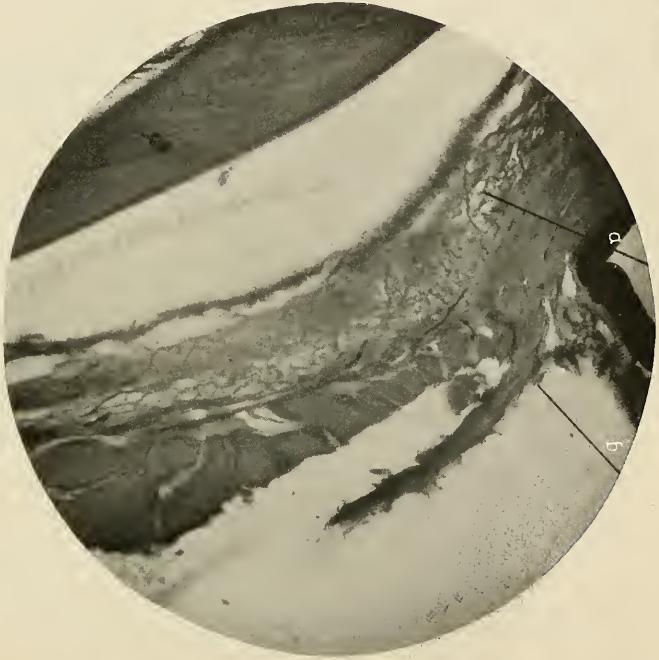

Fig. 6.

Fig. 5. Development of bone in region of suture.
Fig. 6. Development of alveolar process around tooth germ.

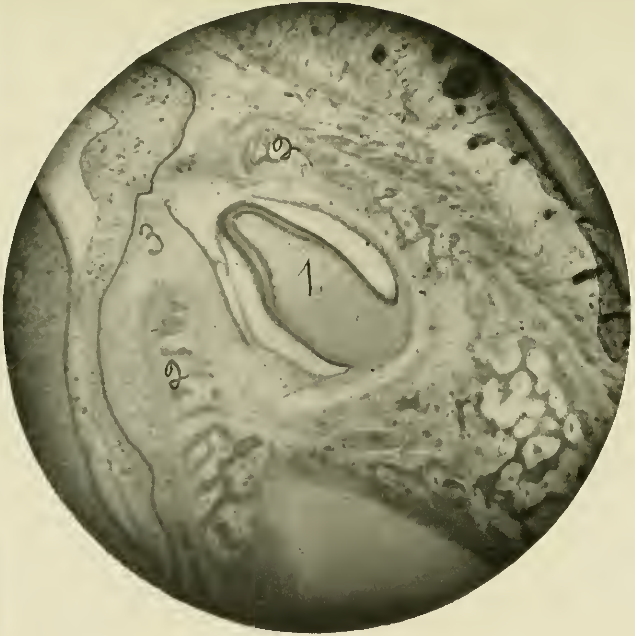

Fig. 7.

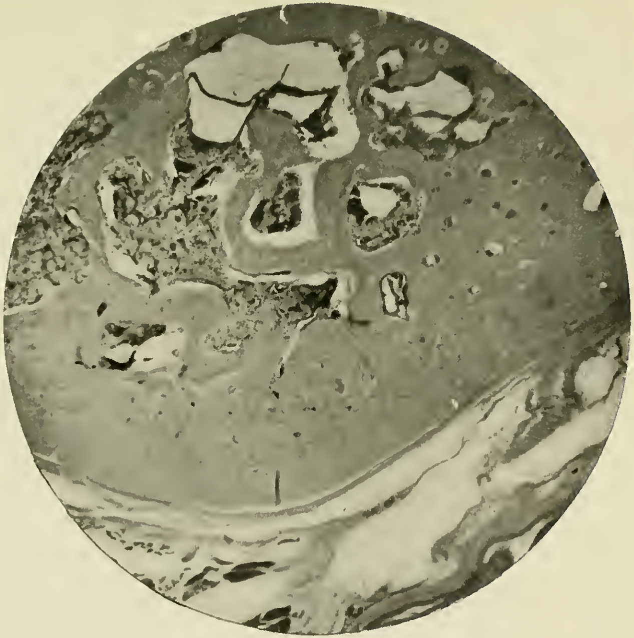

Fig. 8.

Fig. 7. Tooth germ with development of bone around it. (1) Tooth germ. (2) Bone of alveolar border. (3) Gum tissue.

Fig. 8. Cancelous bone below tooth germ.

Experiments in Opening the Suture.

As to the experiments which were made in attempting to open the suture,* the criticism was raised last year, as to the dogs, and that some X-rays should have been made of the animals. It is not a difficult proposition to X-ray a dog.

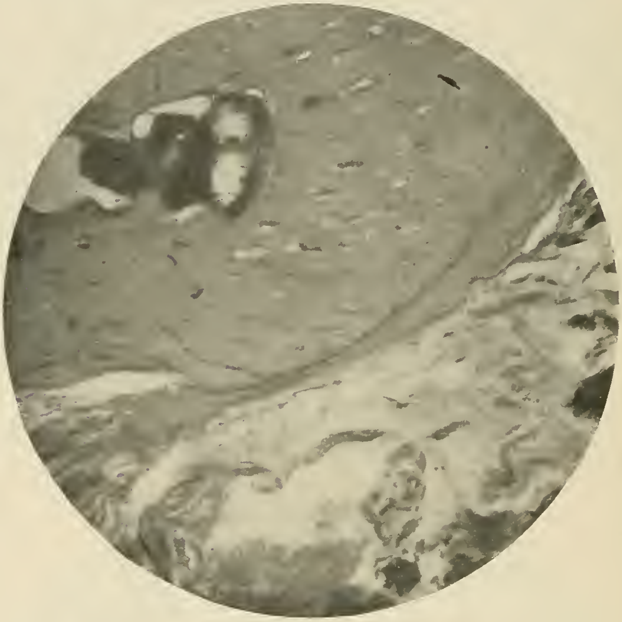

Fig. 9. Thick bone for the region of the mylo-hyoid muscle.

Here is a radiograph (Fig. 10) made at the time the appliance was put on the dog, March 15th. The measurements across the tips of the canines are 15/20 of an inch. After the appliance was put on, another radiograph was made March 17th. This radiograph (Fig. 11) shows evidence of having opened the suture. It is interesting here to note that you have the right and left palatine foramina. You have the right and left half of the superior maxilla as it lies in the dog and the suture extending up to the premaxillæ. On March 23d, which is six days later than Fig. 11, you have an increased weight of 3/20 of an inch. You had this condition here (Fig. 12). (Illustrating.) Here is the rim here, alveolar process and edge of suture. Instead of the suture being open, you have a condition which in this picture shows black (Fig. 13). These are the original lines which represent the right and left halves of the maxilla. Notice how the anterior palatine foramina are situated, because the radiograph film was put to the right of the mouth. On April 10th (Fig. 14) you find you have practically the same condition, because I was out of the city at that time, and when I got back the whole bunch of dogs had their appliances off. But you have a loss of the little articular space which you had before, and it is filled up with something. You can still follow these (the palatine foramina) lines. The distance between the teeth is exactly the same as before. April 17th (Fig. 15) there is a different appearance. You have the anterior palatine foramina farther apart. The dark lines and the lighter areas are easily seen. You notice how the border of the suture curves; this begins to curve because the anterior palatine foramina are opposite the canines. Men say you

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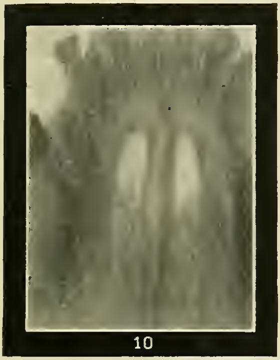
*See "The Development of the Maxillæ," with reference to opening suture. Items of Interest, March, 1913.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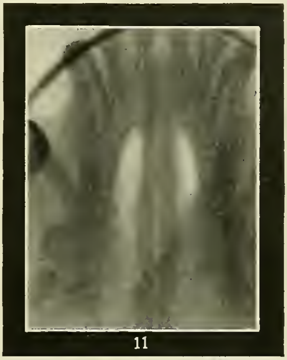
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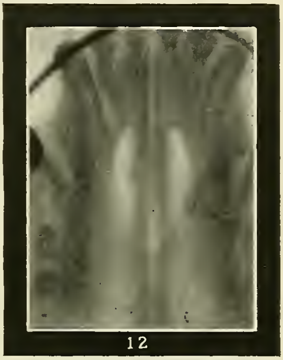
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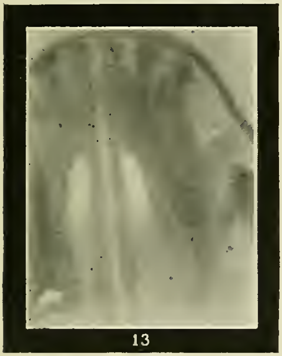
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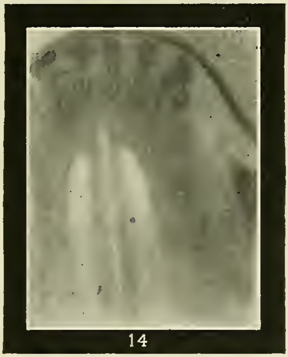
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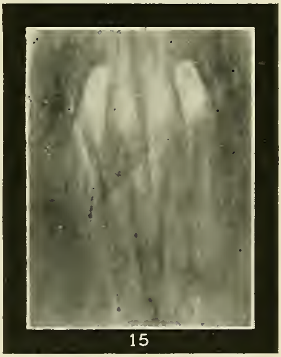
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Fig. 10. Made before appliances were put on. Made March 15, 1913.
Fig. 11. Made March 17, 1913.
Fig. 12. Shows a tooth movement of 3/20 inches over Fig. 10.
Fig. 15. Note how palatine foramina have separated and dark lines where suture was.

cannot spring the bones. We are actually springing the bones, changing the roof of the mouth, and the arch of the mouth becomes lower and the whole thing presents a different appearance. You can see this is opened up in a V-shape exactly, but the opening is across between the two canines. This is opened away back in the region opposite the premolars, as is shown by the photograph of a skull after killing dog (Fig. 16).

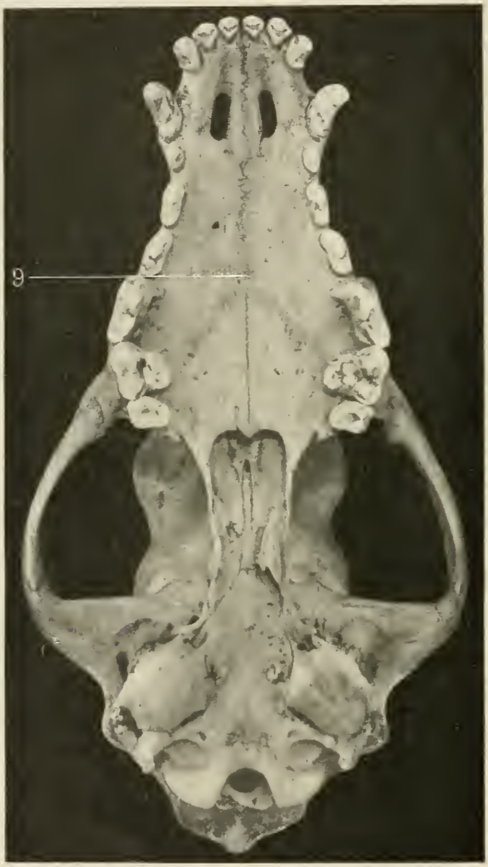
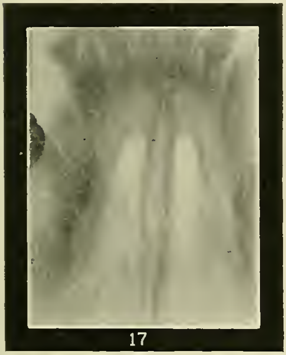


Fig. 16. Skull of dog killed after suture had been opened. (9) Posterior of opening. This dog was not X-rayed, but was used in the 1912 experiments.

Here is a radiograph, April 24th, in which the teeth have been moved (Fig. 17), when there had been an increase of 4/32 incres across the base of the teeth. The dark line which you see is the nasal septum, which has not been disturbed, and the lighter areas which you see on both sides are bone which has developed between the two halves of the maxillæ. (Indicating.) With the dark line disappearing, it shows the whole bone is actually being absorbed, so that you have almost the same density across the suture as before. The whole suture has not been rebuilt here, again, but simply turned down and built over.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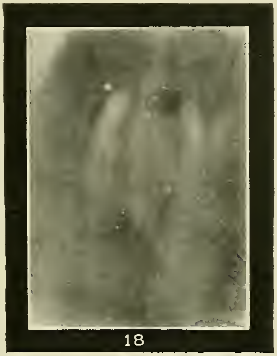
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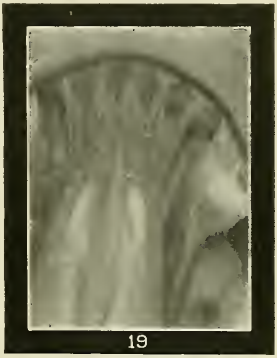
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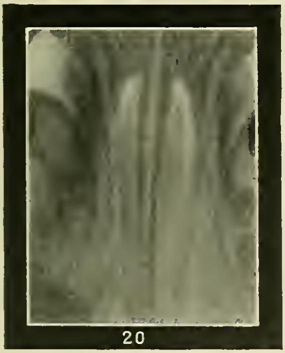
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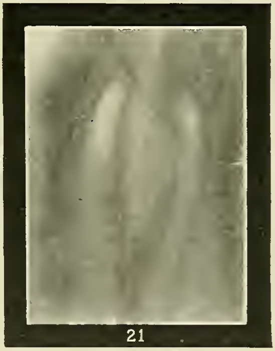
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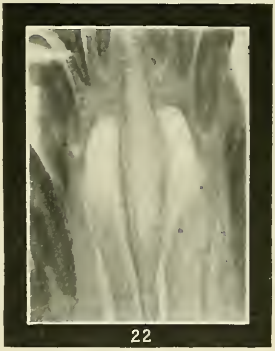
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Fig. 18. Shows bone change through entire region.

Fig. 19. Showing parts before they have been moved.

Fig. 21. Showing springing of body of maxillæ in region of palatine foramina.

Here is a radiograph taken April 30th. At that time you had an increase. The tips of the canines were 22/32 of an inch (Fig. 18) and the base 24/32 of an inch. You will notice the anterior teeth are all together, but the roots have separated a great deal because stress has been transmitted from the canine. The anterior palatine foramen has become separated, new bone has been developed and the new bone does not stop the ray the same as the old bone. Why do the crowns of the teeth stay together with the roots separated so far? They stay together because the histological structure of the gum tissue of the carnivorous animal is very dense. It is full of inelastic connective tissue fibres. The fibres running up under the gingival margin of the gum being inelastic have held the crowns together so that they cannot spring apart. There is bone development around the canine seen here. (Indicating.) You have developed all through the region just as great an increase of bone around

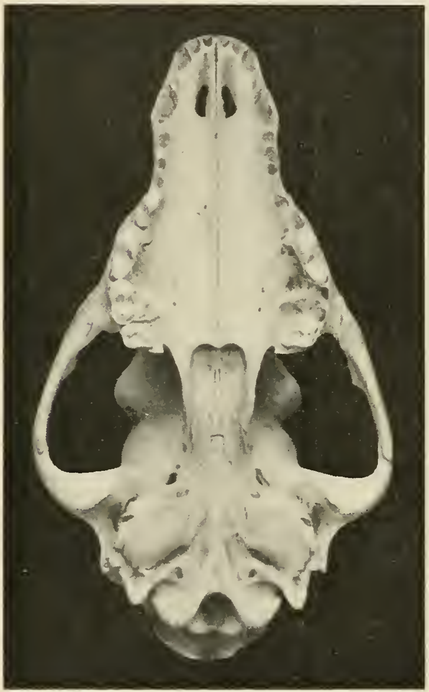


Fig. 23.

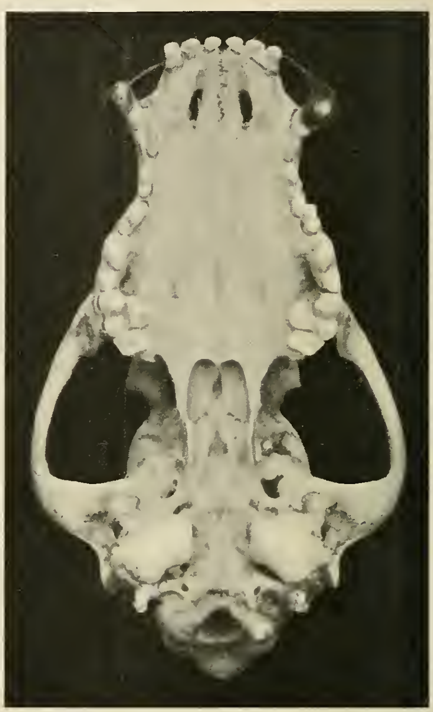


Fig. 24.

Fig. 23. Skull of dog which did not have regulating appliances on. Dog of same breed as Fig. 23. Weight of this dog, 27 pounds. Notice shape of palate.

Fig. 24. Skull of dog which had appliance on teeth. Canine teeth were moved 26/36 of inch. Weight of dog, 27½ pounds.

the teeth, but the external plate of the tooth is developed just the same as the other.

Let me show you another radiograph taken March 21st (Fig.19), and you can see the opening of the dark area stops. You see, the roots of the teeth are decidedly different from those you had on the screen, because these have not been removed. Here is the anterior foramen together.

Here is one made April 10th. Note the difference between the one made April 21st and this. The width of the teeth when we began to work on them was 26/32 of an inch at the base. The anterior palatine foramen had separated (Fig. 20). The gap is wider. You see, the thing has begun to be loose. Bone has developed in there. There is a difference here between 33/32 of an inch and 26/32 of an inch. The dark line which you see is the perpendicular base of the nasal septum and the nostril. The whole suture is closed.

When you have attempted to open the suture, have expanded the arches, and then have cut in there to see whether the suture is open or not, you find it closed. But it has been opened; you have spread the connective tissue in the suture so that the osteoblasts can run through and fill the space.

This radiograph was made April 24th. There was a change from 20/32 of an inch to 22/32 of an inch.

Here is one made May 1st. It shows a difference of 4/32 of an inch.

As a result of the stress applied to the teeth, bone has developed, and developed in response to the force exerted by the appliance. The roof of the mouth has changed in shape and structure as the direction of the spicule has changed.

Here is one made June 3d (Fig. 21), and at that time you have an increase over the original measurement of 20/32 of an inch. In the first you see the anterior palatine foramina closed together. Now they are far apart. The canines are far apart, too, and the whole structure is new bone. The whole thing has been reabsorbed as the result of mechanical stimulation.

Here is a radiograph made of a skull which had had the suture opened. Instead of an open suture (Fig. 22) you have a closed suture. You get spreading of the bones, which unquestionably can take place, resulting in mechanical stimulation of osteoblasts which closed the space. Cutting through dense tissue is no evidence that the suture has never been opened. The bone develops so rapidly that unless you have kept close track of your cases you might think the suture was never opened. Often I have seen men who were enthusiastic as to the opening of the suture claim that the two halves of the nasal septum were the edges of the suture. As I have shown in dogs, the bone will fill in the suture so that the edge of the old suture disappears.

Is there any Advantage in Opening the Suture?

The question arises, what is the practical significance of this? Does it do any good to open the interpremaxillary and the intermaxillary sutures? Admitting it can be done on dogs, the question arises, do you gain any advantages by doing that over moving the teeth gradually? I am of the belief you do not, because observation of these dogs and of the skulls shows that bone has developed all around the teeth, and you have this development as a result of mechanical stimulation. You can put appliances on the teeth in a youngster and widen the arches, and the spicules of the bone which grow in between the suture are the result of mechanical stimulation. The development of the whole alveolar process is the result of mechanical stimulation, and with each individual tooth as it erupts the alveolar process follows it. By moving the teeth you will get the development of the bone all around, and that development of the bone occurs more readily in a young child, but it will occur also in an adult if properly treated. As you spread the arches apart you will get development of bone in between the two halves. but the development of bone as advocated is not going to maintain the expansion of the dental arch. Bone develops all around the teeth, as was shown by the development of bone around the first molar when the appliance was placed on the canines.

The development of bone as the result of an attempt to open the suture has been proven, and the influence which bone has on the retention of teeth is another problem.

Discussion on the Paper of Dr. Dewey.

Dr. O. W. White, Detroit, Michigan.

I do not feel capable of opening the discussion on Dr. Dewey's paper, for the reason that I had no means of knowing what he was to talk about; neither did I see the slides, which are very beautiful. I think, though, if we knew the histological structure of the bone tissue, which Dr. Dewey shows developed during spreading of the suture, we would find it very different in cellular formation from the surrounding bone tissue. Dr. Oppenheim, of Berlin, has carried on quite extensive research work on monkeys, and he shows in tooth movement a very marked difference in the bone formation, little spicula of the bone developing at right angles to the tooth, instead of circular or horizontal. Of course, he did not move the teeth as slowly as Dr. Dewey. He consumed forty days in moving teeth, which was a rapid movement. Dr. Oppenheim found when he removed the pressure, the new tissue was resorbed rapidly, tissues returning to normal. So I think, probably, the tissue developed in these sutures of dogs and monkeys, are very similar. Dr. Dewey should give us the histological structure of this bone and if he did so we would probably see a great difference in the formation. In working on normal arches and tissues in the experimental animals, the conditions are not similar to abnormal and the results are of very little clinical value under such circumstances.

Dr. R. Ottolengui, New York City. I was very sorry when I saw my name on the program to discuss this paper, and more so now. But I want to say, that it does not seem to me that the evidence presented is entirely convincing that those sutures have been moved apart, and for the reason that, in the first place, as I recall the illustrations, those that were most apparent were those in which the sutures were open, so one could hardly say he opened the sutures when they were already open. In the second place, the deductions depend upon the view in which he pictures the arch, which, rightfully represented, shows the borders of the suture are farther apart, and in between them lies new bone. But, it seems to me, the pictures which Dr. Hawley showed two years ago are almost a facsimile of this and his deduction was quite a different one, and quite a logical one, that the bone did not move apart, but that the bone had been stretched. Against that theory is the fact that those dark lines appear to be the borders of the bone themselves. If Dr. Dewey, in addition to these radiographs, both before and after death, can show from microscopic and macroscopic examination that the darker shadows were reflected from dense bone, *and not from tissues that lie above,* I would much more readily accept his deduction.

Dr. C. A. Hawley, Washington, D. C. I do not know that I can add anything to Dr. Dewey's presentation, but I can say that in the last year I have not made any X-rays, nor have I gone any further in an attempt to find absolutely what occurs when the suture is opened; but I have found some cases in my practice where I thought it would be a great advantage to do that operation. I think what Dr. Ottolengui just said is true. When I came to think over those cases (there was something like fifteen to twenty of them), I do not know, that in the majority of them I really gained anything more than I would have done if I moved the teeth slowly. But in some I did. Let me mention one of the first cases. You remember the child, seven years of age, in whose case there was a lingual occlusion of the molars on one side. The case was treated in three weeks. The retention has been good and the teeth have developed normally since that time, and I relieved this child from the nasal stenosis quickly. Within two weeks, the contour of the face was changed, the child was very much better, and the result is permanent and more satisfactory than if I had resorted to slow treatment. The child will have to be treated again when it is older, as there will be a certain amount of malposition of the individual teeth. Then there is a case I treated, a young man eighteen years of age. I have shown X-rays of this case and the apparent opening of the suture, but I cannot say that I really gained anything. I have had to treat that case just as long. I relieved the nasal stenosis a little more quickly I think.

Where this treatment is advisable and would be satisfactory is in the case of a child, seven or eight years of age, where there is lingual occlusion of the upper teeth and you do not wish to disturb the lower. In such a case I would produce a rapid movement and obtain a result in two or three weeks. I cannot see any harm that can possibly obtain from this, and it will save a great deal of time. As most favorable I would select lingual occlusion of the upper molars and bicuspids. If you treat a case by moving the lowers, I do not see you gain anything at all from a practical standpoint.

I recall another case I treated this year in which I used this method. This was not a case where there was a lingual occlusion of the upper teeth, but there was great overlapping of the central incisors. I opened the suture in three weeks, moved the incisors into place and held them there, and that held the expansion in the molar region; then I slowly expanded the lower. That treatment was very satisfactory. It was much easier than the regular treatment. Then I have treated one child, about seven years of age, this year with a satisfactory result. I got through with it in three weeks. It was a success. The nervous condition was relieved quickly. In carefully selected cases of that type it is a valuable method. In these cases I have not put a jackscrew into the mouth when I could get along without it.

I saw some X-rays three weeks ago that were made in the case of a child with abnormal development, where a jackscrew had been used across the mouth, then an X-ray taken. It showed absolute separation of the suture.

Dr. R. Ottolengui.

The men who have advocated this movement have claimed for it advantages that are to be gained in many respects. They have not claimed there can be any advantage to a child in lessening the time of the movement of the teeth.

I consider these experiments of Dr. Dewey of vital interest; at the same time, I want to call attention to the fact that the muzzle of the dog is different from the muzzle of the child. There is considerably more of the dog's muzzle anterior to the attachment of the malar bone than in a child, and a point of great importance is the resistance of this bone. It seems to me a very different thing to spread the anterior portion of the dog's long muzzle or to spread the posterior portion of the palate or any portion of the suture in a child. It has also seemed to me that unless the movement is distal to a line drawn across the bicuspid region, we can hardly expect a great increase in the nasal space.

Another point: In one or two of his pictures Dr. Dewey showed us not only the lines which were originally the sutures spread apart, but an outline through the center which was the shadow cast by the vomer. In some of the pictures where there was as much separation, there was no shadow cast by that bone. What became of the vomer? What is the exact nature of this suture? It is not simply the union of two bones, but immediately above is an attachment of the vomer itself. Suppose the palate bones are stretched apart, it does not seem to me that it necessarily follows that you can get additional space in the nasal cavity, unless you can move apart the lateral walls of the nasal cavity itself. When Dr. Hawley speaks of opening the suture I presume he means only the anterior part of the suture.

Dr. M. N. Federspiel, Milwaukee. I would like to ask Dr. Hawley a question. He remarked that he had a case where we widened the upper arch and improved the nasal stenosis. Did you make an examination of the nose.

Dr. Hawley. No.

Dr. Federspiel. I fear I cannot accept what has been said for the reason that I believe when we widen the upper arch we increase the space for the tongue to come forward, but you do not cure any of the pathologic conditions. Of course, there may not have been any.

Dr. Hawley. I have no evidence in the way of measurements or examination. I wish to say, however, the boy was never able to lie down and breathe through his nose previously, yet at the end of three weeks he was able to do so. It relieved the abnormal condition, whatever it was.

Dr. Federspiel. Patients frequently act nervously when they take ether. This is usually due to the fact that the mandible slips back and the tongue drops; when the assistant draws the tongue forward it permits the patient to breathe more freely.

In regard to opening the intermaxillary suture, time and again I have reported having injected novocain after the arch had been expanded, made an incision, retracted the periosteum in order to find out whether the suture was opened or not. I am satisfied you cannot open the palatine suture, but mechanical stimulation of the maxillary bones will permit of greater stimulation of the osteoblasts to reform bone, and thereby increase the space for the tongue to occupy a normal position.

Dr. Dewey. In regard to Dr. Federspiel's injecting novocain and dissecting down to see whether the suture is open or not, he has only proven it is closed. It does not prove that it has not been opened, and in the dog, in a week's time you have an entirely different condition from what you had in the previous week, as is shown by the X-ray. If you exert pressure on the two halves of the maxillæ a bending of the bone occurs within three or four days and an opening of the suture that will fill up with new tissue. That brings up the proposition as to whether it is bone.

Dr. White says that Oppenheim in his research work found spicules of bone running in different directions. That is brought about by mechanical stimulation, and if regulating appliances and the forces of occlusion are brought to bear in different directions the result will be that the bone will develop in different directions.

In regard to what Dr. Ottolengui says about the maxillæ of a dog being different from that of the human being, that is true, but in the dog experiments you do not get an opening in the anterior palatal region, but directly across from the canines. It does not open in front of, but between, the canines.

I put bands on the canines with a long perpendicular tube on the buccal side; then I take the expansion arch, draw the temper so that I can bend the ends at a right angle and slip right angle end into the tube.

Dr. Ottolengui. The greatest stress is across the cuspid region?

Dr. Dewey. Yes. I open there first. You can use a jack-screw and open the suture, but in the course of a week or so it will be closed up, and you do not gain very much by doing it. In the meantime, if you take off the regulating appliance that bone will be resorbed again.

Going back to the proposition of what constitutes bone, I will say that bone is simply calcified connective tissue arranged around nutrient canals. The bone you get in between the suture is compact bone, or sub-periosteal bone and is a transitory structure. It does not exist very long because it is too thick; not enough nutrition enters the canals and it is changed to the Haversian system or cancellous bone.

Dr. Young. You made the statement that when you separated these bones the new bone changed in a short time, in a week or ten days, and if pressure was removed the bone would be resorbed again.

Dr. Dewey. Yes, sir.

Dr. Young. How long, in your judgment, is it necessary to keep the two lateral halves apart to make sure that the bone would not reabsorb in the cases that come back?

Dr. Dewey. You would have to keep pressure on the halves during the lifetime of the animal. By that I mean this bone developed as the result of mechanical force and you must keep some kind of mechanical force there to maintain it. If you put on an appliance you make that bone develop as a result of the mechanical appliance, and unless the forces of occlusion are the same as the forces of the mechanical appliance the bone will be resorbed because you have taken away one force and another has not been brought to bear on it. You can hold the teeth until you break that appliance off, but if the force of occlusion is not the same as the regulating appliance, the teeth will move as the result of the mechanical force. Bone is a constantly changing tissue. The skeleton of to-day is not the skeleton we will have next year at this time. There is no such thing as permanency in bone. Take a section of bone anywhere from the animal skeleton and you will find evidence of resorption and rebuilding as the result of mechanical stimulation brought to bear on it. The lacuna or bone cell does not belong to any "labor union." In such instances, unless he is rescued by osteoclasts he is a dead cell, and undergoes necrosis. The bone in the dried specimen is the inorganic portion of it; the organic portion is the lacuna, so that as a result of that I am prepared to make the statement that the final solution in retention is the final solution in the adjustment of the forces of occlusion to hold the teeth in that position, and keep the bone developing all the time.

Dr. Federspiel. Would you attribute that to forms of malocclusion? Would it depend upon malocclusion?

Dr. Dewey. Retention in all cases of malocclusion depends upon the forces of occlusion.

Dr. Federspiel. Regardless of what the etiological factor may be?

Dr. Dewey. Yes; all etiological factors of malocclusion act, because they destroy some one or more of the forces of occlusion.

Dr. W. C. Grisamore. In the bodily movement of teeth do you move the tooth beyond the alveolar process?

Dr. Dewey. I never have. I have moved the canine teeth in dogs so that in opening the suture I have moved the alveolus, although necrosis has not been the result because the canine is moving with the alveolus.

Dr. Grisamore. Did you ever move the cuspid so that the apex of the root came through?

Dr. Dewey. No. I do not believe you can do it unless you have a pathologic condition around the teeth.

Dr. Ottolengui. I have seen a case where the anterior roots had been moved by an appliance until four of the roots were sufficiently prominent to put the finger on the apices and feel them and they were covered with bone and soft tissue.

Dr. Case. When the force of an appliance is stopped, the tooth stops moving, does it not?

Dr. Dewey. The teeth may move as a result of natural force.

Dr. Case. You said the forces started the cells working the minute they stopped moving.

Dr. Dewey. Cell activity produced by the mechanical appliance stopped and the natural forces of occlusion then produces a cell activity.

Compromise Treatments.

By Lloyd S. Lourie, Chicago.

Read before the American Society of Orthodontists at Chicago, 1913.

The American Society of Orthodontists has always been a staunch and ardent advocate of normal occlusion as the basis of orthodontia and as our goal in treatment. If it is to be criticised in this regard, it must be on the score that enthusiasm has caused an apparent disregard for obstacles or limitations.

From manifold and continued reports of wonderful results, many have been led to believe that all things are possible in orthodontia. Some orthodontists have even been so radical as to say that only attempts at securing normal occlusion fall within the domain of orthodontia, and that other plans of treatment are inexcusable, and even mal-practice. Several of our members, however, are of the opinion that much harm has been done our specialty, as well as the orthodontist and patient immediately concerned, by attempts at impossible or ill-advised treatment, and at the request of the chairman of the Board of Censors I present for your discussion the following questions, the idea being to develop a general discussion of our limitations.

I. Is it possible in all cases to place and retain all of the teeth in their normal anatomical relations?

II. Even though ultimately possible, is it always advisable to attempt it?

For my part, both must be answered in the negative. When one has satisfactorily treated several cases of extensive malocclusion, he is impressed by the responsiveness or mouldability of the alveolar process and adjourning parts; and is led to conclude that "it is possible to move the teeth into any position desired." Sooner or later, however, we must all be impressed by the variability of these same structures. Who can say, for instance, that the alveolar process will not be absorbed and fail to be rebuilt, or that the effects of mechanical stimulation will stop at just the desired stage? I must confess my inability to do so, and when confronted by alveolar processes and gums with atrophic tendencies, am willing to arbitrate. Also, I am keeping a "weather eye" open for the effects, on adjoining parts, of overdeveloping or overerupting second and third molars.

Supposing now that we are wise enough and skilled sufficiently to invariably secure normal occlusion with all of its accompanying utility and beauty, are we always justified in doing so? In older patients, particularly, may we not be of more practical benefit by sacrificing some of our ideals for expeditiousness and utility? Probably it will be of assistance to consider a few actual cases, occasionally taking the patient's point of view.

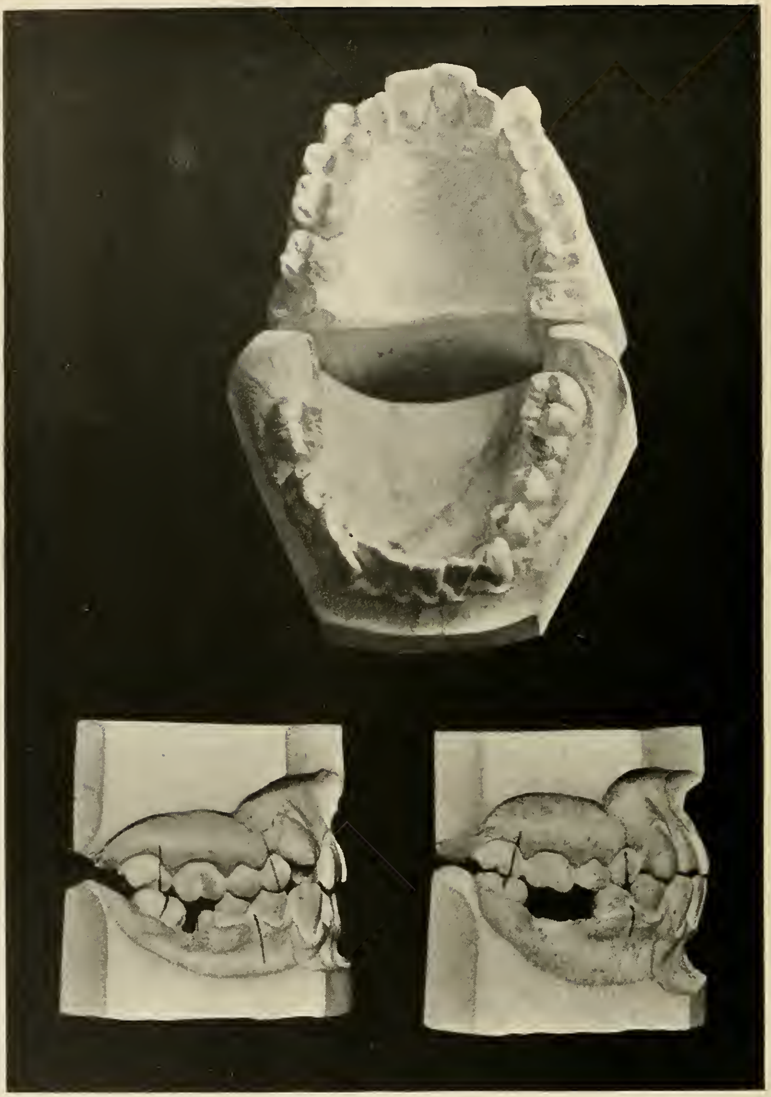
The first two were shown to this society at the Philadelphia meeting in 1902, and I was quite proud of them, because of having accomplished something new in the attempts at restoring ideal occlusion. My purpose of moving distally molars and bicuspids to avoid extraction was successfully accomplished, but normal occlusion was not established. In fact, a better occlusion would have been obtained in each case if other treatment had been followed.

Case I.

Age 18, young lady, small features, large teeth. Extraction of upper first bicuspids and closure of first molar spaces would have shortened and simplified treatment, as well as giving better occlusion and less danger of gum and alveolar process recession. Incisor overlap would have been better and artificial teeth would have been avoided.

Case II.

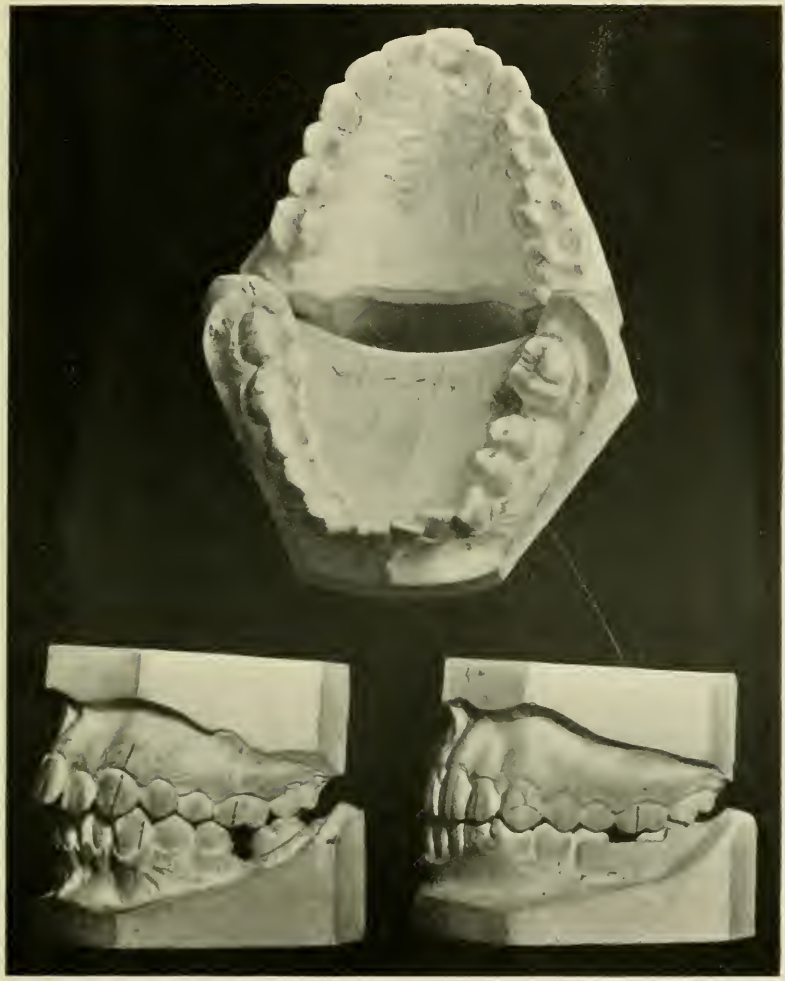
Age 14, girl. Early loss of upper right first molar and lower left first molar resulted in unbalancing of two arches. Left half of upper arch was moved distally to avoid extraction. Extraction of upper left first bicuspid would have allowed more satisfactory treatment for all parties concerned. Incisor overlap would have been better and a bridge avoided. Retention would have been easier. Opening of the bite in these two cases made lip closure difficult. At the time we had been led to believe that this difficulty would adjust itself with the settling of the teeth into their sockets from use, something I no longer count upon. The thing to do is to avoid opening the bite in treatment, as it will not suffice to



Case I.

elevate the anterior teeth, because that makes them more conspicuous and lip closure difficult.

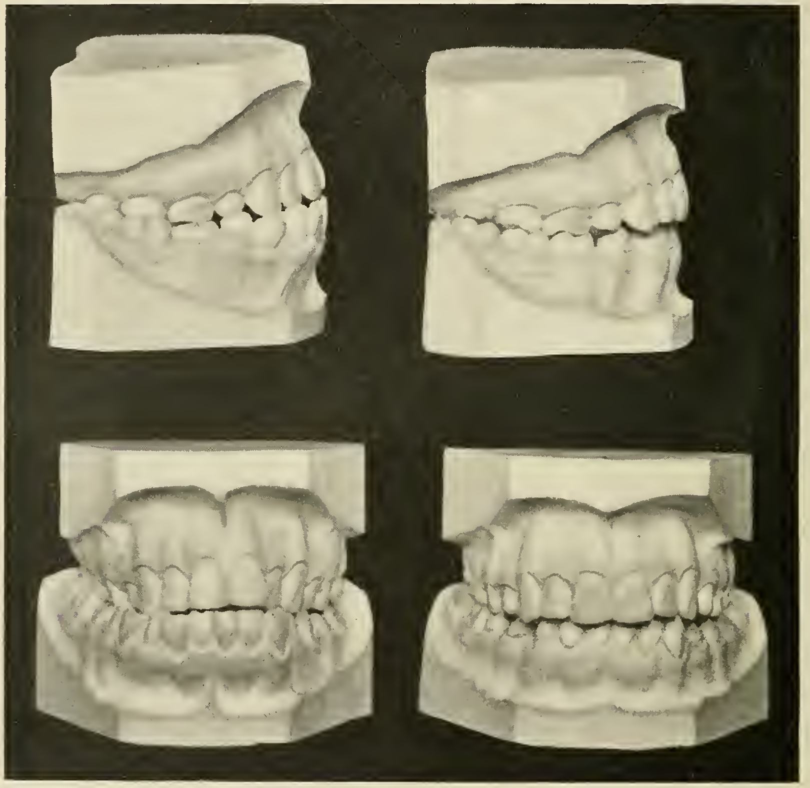
Case III. Age 19, young lady. Previously lost upper first bicuspids and spaces entirely closed, and largely by mesial movement of bicuspids and molars. No incisor overlap. Opening upper arch for first bicuspids would have caused



Case II.

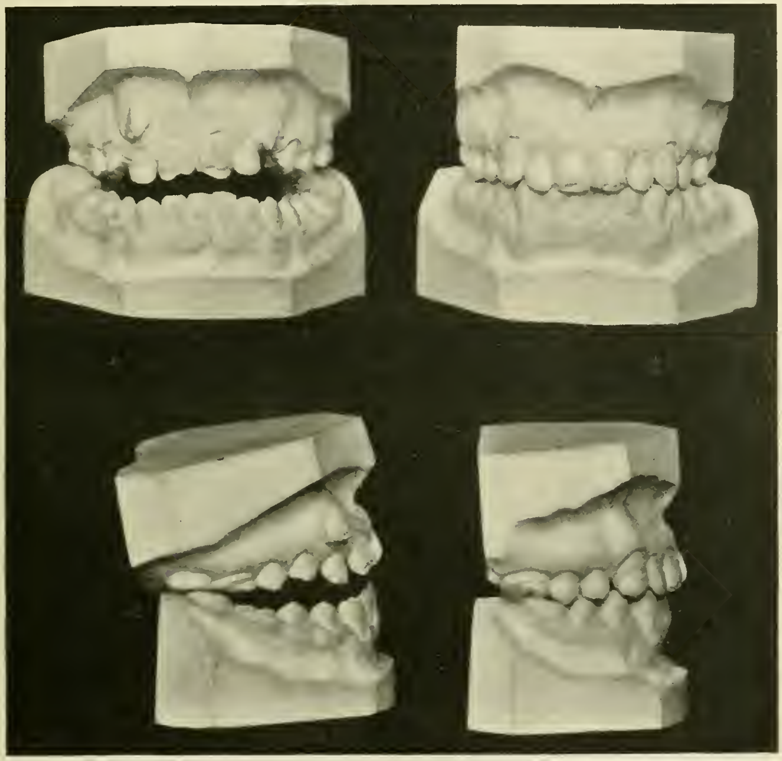
prolonged treatment with doubtful results, especially in closing the open bite condition which probably would have resulted. Extensive disturbances of matured alveolar process might have resulted in permanent injury. All of the above and two bridges were avoided by extraction of lower first bicuspids. This was the first case in which I compromised by extraction, and there never since has been any reason for me to doubt that it was the correct procedure.

Case IV. Age 16, boy. Lack of occlusal contact, excepting second molars, due to excessive eruption of those teeth in lower arch. Treatment without extraction would have necessitated depressing molars in sockets or elevating all anterior teeth into unsightly supra-occlusion, without improving facial lines. Extraction of second molars allowed closure of bite with immediate facial improvement and avoided a protracted treatment with doubtful results. Depression of molars was possible, but not probable, while simply drawing anterior teeth together would have been making an added deformity in attempting to compensate for that in molar region.



Case III.

Case V. Age 15, girl. Lower first molars previously lost and spaces practically closed, leaving facial effect of retruded mandible. Patient objected to opening lower first molar spaces for bridges. Case treated as though the second lower molars were firsts, with results satisfactory to patient and to me. Of course, it is not normal occlusion, and some grinding of second molars was necessary to allow them to serve in place of the first molars; but I feel that the patient was served better than by an attempt to secure normal occlusion.



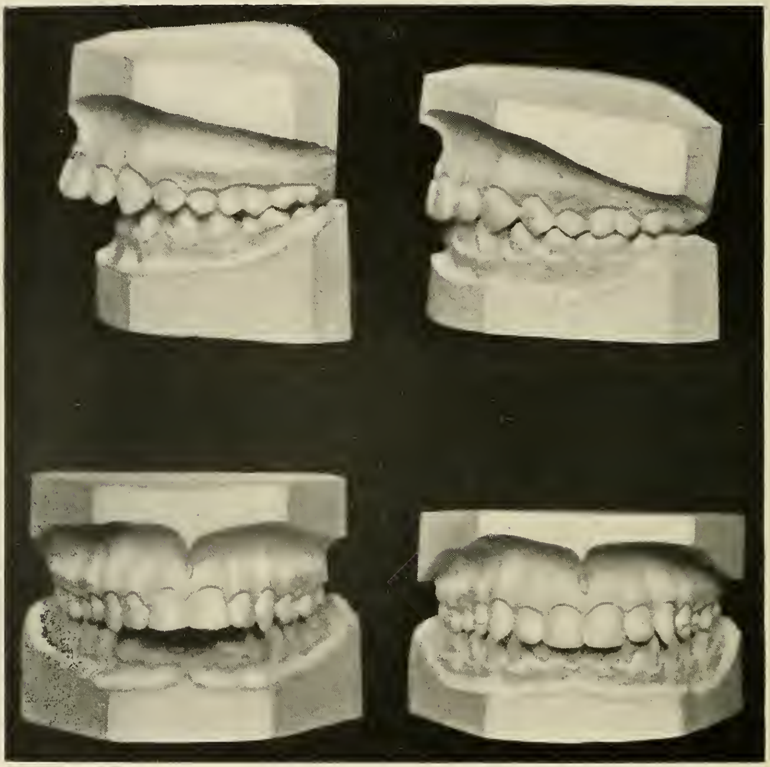
Case IV.

Many of those present will doubtless disagree with my decisions in these cases, for difficulties to one may not be such to another. However, the details of treatment are not the subject under discussion, but rather the question of advisability of compromise treatments.

At the present time a consideration of the subject naturally has to do principally with older patients, in whom the most favorable bone-growing period has passed and among whom mutilations or incomplete dentures are so frequently encountered. With the more general acceptance of the doctrines of early treatment and the employment of preventive measures there should be a constant decrease in the conditions under consideration; but I fancy it will be some time before we can eliminate them from our list of troubles.

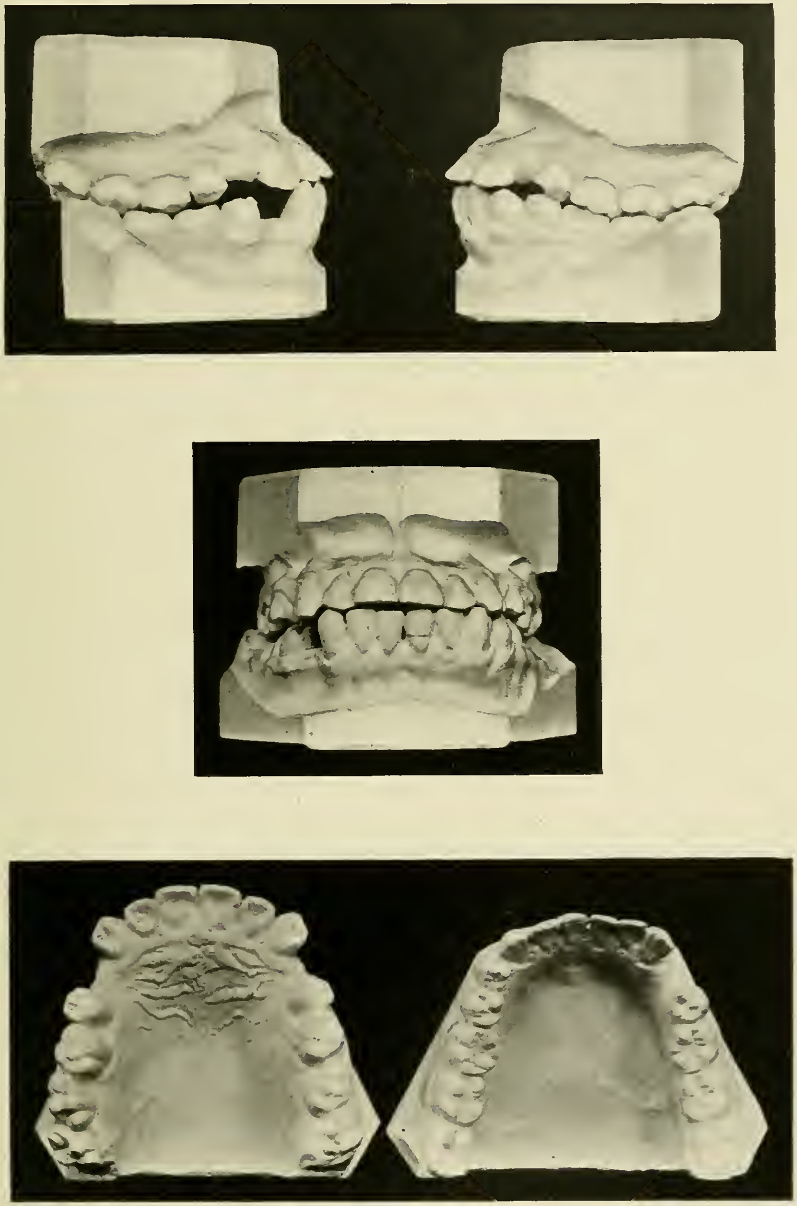
Discussion on the Paper of Dr. Lourie.

Dr. Wilson Foster. I think this paper of Dr. Lourie's is a very timely one. I know when I first started I attempted to open up the spaces for missing teeth and got into serious trouble. I am very glad now to compromise in many cases. I see no reason why the Society should abandon or change the idea of the basis of orthodontia. Wherever there has been accomplished anything worth while, there must have been some definite or underlying idea toward which to work. In orthodontia this is normal occlusion. In a great many cases we can utilize this idea to the satisfaction of our patients and ourselves. In other cases it is impossible to do so and at the same time benefit our patients as we should be able to do. We should be able to recognize these particular cases when they present for treatment and do the best for the patient, even though we sacrifice some of our ideals.



Case V.

Dr. Lourie spoke of the opening of the bite during treatment, which



Case VI.

has been a stumbling block for many. I thought it was due to my faulty technic, and if Dr. Lourie or any other member has found a solution of this he would confer a favor by telling us how to avoid it. I have been hoping for much in this direction from the new Angle appliances.

I congratulate Dr. Lourie on the beautiful results he has obtained in Cases 3, 4 and 5.

Dr. C. A. Hawley, Washington, D. C. I do not wish to prolong this discussion unnecessarily, but there is another phase of compromise treatment which I wish to illustrate.

I am thoroughly satisfied there are cases in which a compromise treatment is necessary, and I am likewise convinced that there are cases in which the extreme effort to obtain normal occlusion does harm. This type of case I have observed in a number of instances, and one case I would like to illustrate (Case 6).

This case was originally treated when the girl was 16 by a general dentist, who extracted the upper first bicuspids and the right lower. If the case had been treated by restoring normal occlusion at that time, it might have been perfectly successful, but the girl received no further treatment at that time. Two years later she went to a neighboring State, and some man, when she was 18 or 19 years of age, attempted to open the spaces for the bicuspids and restore complete normal occlusion. What was the condition at the time? The incisors and cuspids had not closed the space by moving backward, but the molars and second bicuspids had moved forward, and in attempting to restore the spaces for the first bicuspids, the incisors and cuspids were moved far forward of their normal positions and were laid out as nearly horizontal as any teeth I ever saw in a human mouth. The girl was dismissed with the assurance that bone would build up and that the teeth would become upright. I think it is one of the worst deformities I ever saw as the result of treatment. The case was not treated properly in the beginning. The second man did not recognize the real conditions. He went on blindly to restore normal occlusion. A compromise treatment would have produced far better results.

Dr. Dewey. Was he a recognized orthodontist?

Dr. Hawley. He was devoting a good deal of his time to orthodontia.

There is another of cases that is difficult to discuss without illustration, cases that have passed the period of development. We will agree for a moment that in most cases nature has given the person teeth that will be best suited to the ideal development of the physical body, but for some reason the physical body has been stunted in growth and has reached a mature age. The teeth at this time are in malocclusion, and if placed in normal arches and the alveolar process developed, the alveolar process and teeth will be out of all proportion to the rest of the face. I do not like to say this is a general class, but there are such cases. We have a different situation to deal with in restoring normal occlusion of the teeth when patients have passed the age of development. I am unwilling to say that restoration of normal occlusion in these cases is always the best.

Dr. H. A. Pullen, Buffalo, N. Y.

In the introductory portion of his paper, the essayist has referred to this society as "a staunch advocate of normal occlusion and our goal in treatment." With equal candor it may be said that this society is open for conviction to whatever is opposed in theory and practice to this same ideal.

Hence it is that compromise in treatment, or departure from the ideal, will be viewed with the same or even greater interest, especially when presented by such a staunch advocate of normal occlusion as the essayist always has been known to be.

An armless Venus is apparently a departure from the ideal, and to the unobserving may only present deformity in the loss of two probably perfect arms, but to the thoughtful and observing mind the beauty of the figure of this shorn ideal may fully compensate for the lack of arms.

Likewise it may be said that any necessary departure from the ideal of normal occlusion, if viewed from the right standpoint, may present a shorn ideal of great value.

Whether the reason for this departure from the ideal be expeditiousness, utility, or any other of a number of things, the great fact remains that these departures are *very rare exceptions to the rule.*

A compromise treatment of the nature of those shown by the essayist should be, like the crowning of a tooth, the very last resort.

Extraction of teeth in particular is always a contra-indication in the prognosis of cases of malocclusion, and the consequences should be thoroughly and carefully studied before adopting such a measure of relief.

Personally, I have extracted but three teeth in cases of malocclusion in thirteen years, and these were in cases which had been already mutilated by extraction.

On putting the question to most of the members of this society individually, I find that some of you have never extracted teeth, and many of you have about the same percentage of tooth extractions to your credit as myself.

The limitations in the production of normal occlusion can never be adequately described from the experiences of any one man, as no one man's experience is sufficient; neither is his ability nor his perception accurate enough to render final judgment without confirmation by his contemporary practitioners. For example, one orthodontist may obtain a result of normal occlusion in a case in which it would be impossible for another less skillful orthodontist to obtain it.

These are personal limitations, however, and should be only taken into account in order to obtain a proper perspective whereby we may see the whole subject clearly.

The essayist, at the request of the Board of Censors, presents the subject of the limitations in the production of normal occlusion in treatment in the form of two questions, the answers to which are expected to reach the heart of the matter.

First: "Is it possible in all cases to place and retain all of the teeth in their anatomical relations?"

Second, "Even though ultimately possible, is it always advisable to attempt it?"

I am sure that every experienced orthodontist would answer both of these questions in the negative, as has the essayist, which does not entirely dispose of the subject under discussion.

A further disposition of the subject which would require the most careful study and differentiation in a symposium of the combined experiences of many orthodontists would answer more vital questions as to the class of cases and the differential diagnosis of cases in which normal occlusion is attainable and those in which it is not, and in cases in which it is advisable to attain it and those in which it is not.

With the present ideal of the orthodontist, treatment under 15 and 16 years of age usually results in normal occlusion and harmonious facial lines.

Beyond this period the individual judgment of the operator should be carefully cultivated through a conscientious study of every involved condition, that compromises should be avoided if possible.

In cases already complicated by extraction and those in which extensive caries of the teeth has taken place, the dividing line between the ideal treatment and the compromise way seem hard to differentiate.

The fewness of the cases shown by the essayist in which he has compromised, as it were, shows that this departure from the ideal is not a serious handicap to the restoration of normal occlusion in his practice, nor is it in any of ours.

A finer interpretation of the results obtained by the essayist might be gained by the study of the faces of these cases, which, unfortunately, he has not shown.

As time goes on, I trust that the members of this society will report cases of similar or unlike nature, so that we may all gain by their frank discussion.

If fear of criticism of results may deter members from presenting these cases, it should be understood that the consent of the members who report these cases to have their reports published should be first obtained.

There can be no question of Dr. Lourie's ability and judgment, and if in his practice his results seemed expedient, or of greater utility, or the lip closure seemed better, I am not willing to be the one to call him to any critical account, although I am not certain that my plan of treatment would have been the same.

The President. Dr. Lourie's paper is now open for general discussion.

Dr. R. Ottolengui, New York. I think a paper that brings before us the question of our limitations is equally as important as one which brings before us the question of our possibilities.

I would like permission to talk on this subject from an entirely different angle. The cases discussed are somewhat later in life than those I wish to discuss, and they deal with mutilation. We have a large problem confronting us when we have to deal with the young mouth in which a tooth or teeth are congenitally absent. It seems to me the time has come when we must cease to be hide-bound in our dogmas. To explain more fully what I mean, let me say that the general tendency at the present time is to insist upon a definite number of teeth in every mouth. The natural teeth must be placed where they belong, regardless of the congenital absence of other teeth. I think the sooner we get away from that idea the more quickly will we be making progress in treating these cases as a separate class. Some one not long ago said that the bridgeworkers would soon develop a technic which would be a satisfactory solution of the problems which we leave for them to solve, when we follow our religious tenet and move all the teeth into proper places and leave spaces for the bridgeworkers to fill. Thus far they have not done so. I want to say two things along this line.

First, is it restoration of normal occlusion to place teeth in normal physiognomic and physiologic line one to the other, but with spaces between them, without the natural intervening organs which are needed to keep them in those positions? Or supposing that these spaces can be filled, are we to restore normal occlusion with the assistance of the prosthetic worker, when to do so we must compel two tooth roots to do the work of three in carrying a bridge? It seems to me that in addition to the actual position of the teeth we must remember the physiologic functions which they perform. We should recognize the fact that in youth one live tooth is worth two dead ones or pulpless ones. We should recognize the fact that teeth operating in the arch as units serve better than two individual teeth bound together to do the service of three.

One problem which the prosthetic men are studying, but have not yet been able to accomplish, is the construction of bridgework in which the teeth move as units and which does not put stress upon the adjacent teeth.

Dr. Fred'k C. Kemple, New York City.

A serious problem that confronts us more often than extracting is what to do when one or two teeth are congenitally absent or have been lost. Shall space be made where these teeth are missing and artificial substitutes inserted? How shall these be attached? By partial plate, fixed or removable bridgework? How? It is a difficult question and has not yet been satisfactorily answered.

In the large majority of cases where only one or two teeth are missing (not adjacent) I believe it is preferable to close the space, if possible, by moving the teeth together, rather than resort to the unsatisfactory expedient of any kind of artificial teeth at such an early age. It is a serious matter to mutilate young teeth for bridge attachments of whatever kind, and a partial plate must be a constant source of annoyance to the patient and jeopardy to the natural teeth and soft tissues of the mouth.

Where several adjacent teeth are missing artificial substitutes must be used; they are our *last resort* and should ever remain so. In such mutilated cases an ideal result from treatment is impossible. Artificial substitutes are a compromise; closing the spaces is a compromise; but I believe the latter, in most cases, is the lesser of the two evils. I would make exceptions of those cases that require a normally large arch to aid in normal breathing.

This is the first time, I believe, in the history of this society that the question of the advisability of sometimes extracting in order to facilitate treatment or secure retention has been discussed. This is the thirteenth annual meeting—thirteen years without feeling the necessity of discussing the question of extracting in the treatment of malocclusion is a splendid record for this society. If this has been an error, and I believe it has not, it is certainly erring on the side of safety—on the side of conservatism.

All of us, I presume, have adopted the rule, "Never extract," and in my opinion it is a safe rule to follow. There will come into the average practice in orthodontia very few cases in which it would be wise to deviate from this rule, and these few cases would probably be confined to patients past sixteen or seventeen years of age. In my own practice, in order to facilitate treatment, I have extracted only one tooth for a young patient, and then my judgment was wrong; the tooth should not have been extracted; the result would have been better if it had been kept.

But there are exceptions to every rule, and it is these rare exceptions that Dr. Lourie is discussing in his essay. I have seen a few of the cases to which he has referred in his paper, and I must agree with him to this extent; probably more satisfactory and pleasing results could have been obtained in these cases, and both treatment and retention simplified by the judicious extraction of one or two teeth.

I have seen one or two cases where extraction had been resorted to with gratifying effect. One of these came to my attention soon after I returned from Dr. Angle's school in 1900. A young lady, attractive in appearance and with pleasing facial lines, with beautiful teeth in good alignment and in good occlusal contact, had the two upper first bicuspids missing. I was surprised to see this; it rather shook my faith in the "law," but I realized that such conditions are very rare. On inquiry, this lady told me that her "teeth had been very irregular and prominent when she was a child, and that her dentist had extracted these two bicuspids when he straightened them."

In order to maintain retention of some cases it may be necessary to consider extraction of lower third molars more often than any other extraction, but these cases are also rare. I would still maintain the rule, "Never extract," and would emphasize the fact that *only in rare and exceptional cases is extraction indicated.*

Dr. C. C. Grisamore, Chicago.

I would like to take this opportunity to congratulate Dr. Lourie upon his paper. A man who comes before this society and reads a paper of this kind and shows where he has made a failure is one who deserves great credit.

It is seldom that a case comes to us where it is necessary to extract a tooth or teeth, but I do think we get such cases occasionally. It is an entirely different proposition to take a young individual who comes under our care, six or seven years of age, and give the treatment the patient should have to develop normal arches. That is all that can be done; but what are we to do with the older patients, those who are 18, 20 or 25, and we do get them? We have to deal with them, and they want results. In some of these cases this can best be done by wise extraction. Sometimes I hesitate before I extract a tooth or before I would advise another dentist to do so, because I always feel if you advise a man to take out a tooth in a case he will do it, and then next week, when another case presents, he thinks it is similar and that the same treatment should be followed, although the case may be entirely different.

Dr. Martin Dewey, Kansas City, Missouri.

Several years ago Dr. Angle promulgated the doctrine that the best balance, the best harmony, would be obtained by having the full complement of teeth. I still believe it. After seeing Dr. Lourie's slides, I believe it more than I did before. I believe it because it is a question of judgment on the part of the individual orthodontist who sees these cases.

The first case he showed was treated several years ago, where he opened the space for the first molar. He said the overbite was too short. I would like to know how he knew it was too short; he would simply answer because of his judgment, probably. The length of the overbite of the anterior teeth, as I said yesterday, as proven by comparative dental anatomy, depends upon the length of the cusps. The case shown had a short cusp of the molar and should have a short overbite. In other cases he treated and showed the overbite was too great. That is not my judgment, but is a rule based on comparative dental anatomy. The loss of the first molar or any tooth has a tendency to produce an excessive overbite, and there are more pathological conditions being treated to-day, more cases of pyorrhea caused by excessive overbites than by short bites. Those of us who are so situated as to observe cases of pyorrhea, and have seen a variety of them, must have been impressed by the large number of instances in which the principal etiological factor was an excessive overbite. Where one bicuspid had been extracted, and Dr. Lourie took out another, the overbite was too great. In a few years he will have the lower incisors striking against the upper gum. That will cause more trouble in treating these cases and eventually putting in artificial teeth.

Where teeth are congenitally absent, as described by Dr. Ottolengui, another phase of the subject is opened up. We must be careful, and I think Dr. Lourie has erred because of the rule such I have laid down in producing the overbite in this case.

He speaks of another phase of the question—mature alveolar process. I do not know what he means. He intimates that the alveolar process or the osseous system stops growing; that it never changes. There is no such thing, because the alveolar process and osseous system are constantly changing, and they keep changing as long as we live, and what he means by mature alveolar process is something which I do not understand. I still contend that the greatest balance or the best result for the individual is obtained with the full complement of teeth, and advocating compromise treatments, obtaining results which are entirely out of keeping with anatomy of the parts involved is wrong.

Dr. M. N. Federspiel, Milwaukee.

I wish to say that compromise treatments are practiced in every phase of medicine. We compromise treatment in diabetes, in nephritis, and in general surgery. It is not always possible to produce ideal results in the practice of orthodontics, therefore we are called upon many times to obtain an improved condition. I wish to congratulate Dr. Lourie on the position he is taking. He is working along correct lines.

Dr. J. Lowe Young, New York City. I am very glad to have had the opportunity of listening to Dr. Lourie's paper, but to take issue with him without a careful study of the models and photos of each case I believe would be foolish. I am convinced that the essayist would be one of the last men in this society to resort to compromise treatment without careful study, probably extending over months, of models and photos of the case, and that when he decided on compromise treatment it was owing to the fact that he considered it the best course for the patient.

There is no doubt we have our limitations in this work, and the older the patient the more certain we are to encounter these limitations. After patients have passed the period of normal bone growth surrounding the teeth, we have to a very large degree reached limitations. I wish to repeat once more, I am convinced that to be successful we must resort to early treatment, or, still better, preventive treatment where possible.

In ten years I have advised the extraction of but one tooth, and that was for a patient nineteen years old, who had one upper lateral absent and the other lateral very small, or what is known as a peg tooth. In this case one lower first bicuspid was removed, and I am convinced, as the models will show, that it was the best course for this patient.

Dr. Guy G. Hume, Toronto. I would like to ask Dr. Lourie a question. I think in Case No. 3 he has certain characteristic facial features of Class 3, if I understood him. Would it have been practical, or did you think of treating the condition and establishing the mesial relations of the upper molars to the lowers. The reason I ask the question is that at the present time I have under my care a case that was started in that way, and I am continuing the treatment. There is a very marked inclination of the upper central incisors, and I was doubtful at the time when I saw the case whether it was practical or not. This young lady was seventeen years of age. She originally came to me and I diagnosed the case and believed the best treatment was to open the spaces for the first bicuspids. She went abroad, and during that time I communicated with the dentist across the water, and he thought from the standpoint of treatment I was wrong, and that he would treat the case as a Class 2 case, establishing that relation, that is, a mesial relation of the upper molars to the lowers. When she returned I continued treatment, and I am still working on it. From that standpoint I would like to have Dr. Lourie answer the question,

Dr. Lourie. I would not have considered it in this case at all, because in my method of shifting the mesio-distal relation of these teeth I would have caused considerable opening of the bite, and that was one of the difficulties I wanted to avoid, because I find it requires long treatment to get satisfactory results in closing the bite in these conditions.

Dr. Dewey spoke about the length of the overbite being proportionate to the length of the molar's cusps. I am familiar with that theory, and think, as a general proposition, it is correct. It will not hold entirely, for there is not enough variation in cusp length to account for the variations in length of the overbite.

Instead of considering the length of the molar cusps, I would much rather decide what the overbite should be by considering the size and shape of incisors. I feel there is usually a definite place for upper incisors to receive the occlusal contact of the lower incisors. This is not scientifically accurate, but clinical experience will confirm it.

Dr. Dewey says he does not know what I meant by using the expression mature alveolar process. The term mature alveolar process is probably inaccurate, and I will admit that the alveolar process is never mature in the sense that it stops growing; but I have always understood that in early life the alveolar process is a more cancellous structure and the cortical plate not so dense as in older patients. When I spoke of mature alveolar process I meant an alveolar process that has the characteristics found in older patients, an apparently dense cortical plate, and very little cancellous structure, and in many cases practically nothing but a cortical layer.

I am glad the subject of teeth that are congenitally absent was brought up. There are many things that enter into the consideration of compromise treatment that I did not mention. It is not simply a question of whether we should extract teeth or not, and I hope it will not be thought that we are receding from our ideals with reference to the general proposition of extraction. We must all recognize the necessity of extraction in some cases, because we realize our limitations.

Soldering Devices.

By Herbert A. Pullen, D.M.D.

Clinic before the American Society of Orthodontists, July, 1913.

The constructive technic of the new Angle appliances requires more delicacy of manipulation, especially in the soldering technic, than has heretofore been necessary for the older appliances with a less number of parts and requiring less accuracy in fitting. Hand soldering, although still effective for the uniting of the larger parts of the new appliances, has given place to a method whereby the smaller parts to be united, such as the vertical tubes to the plain bands, and the upright rods on the middle arch sections are held in jigs or clamps.

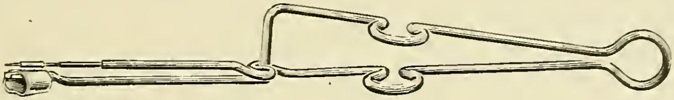


Fig. 1.

The method followed by the writer is one in which the soldering clamp is made to do the work of the jig in holding these smaller parts of the appliance in approximation during the soldering operation.

Fig. 1 illustrates a combination clamp for holding the vertical tube in position on a plain band while being soldered. Into the upper arm of this clamp is inserted a short section of Stubb steel wire, tapered at one end to receive and tightly hold the small tube, so that it cannot be lost or displaced during its manipulation. The spring of the clamp automatically approximates and holds the tube and band in the position desired for uniting with solder.

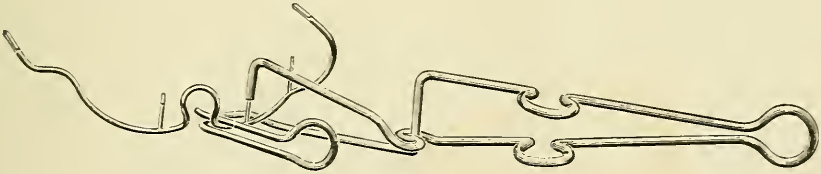
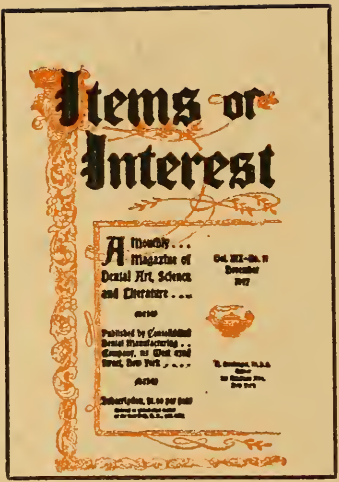


Fig. 2.

A still more delicate soldering operation is that of uniting the upright rods to the middle arch sections, and this is accomplished by the writer by means of another combination clamp shown in Fig. 2.

The upright rod is inserted in a hole of the same diameter in the upper arm of the clamp, where it is held by friction. The middle arch section is slipped into an extra spring arm on the lower part of the clamp, where it is securely held, while the upright rod is adjusted to position and soldered. The angle of inclination of the upright rods is determined entirely by the accuracy of the eye in judging this angle after trying the middle arch section in position in the mouth.



Items of Interest

A Monthly . . .
Magazine of
Dental Art, Science
and Literature . . .

THE AMERICAN SOCIETY OF ORTHODONTISTS

Serial
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1914

FOURTEENTH ANNUAL MEETING
HELD AT
TORONTO, CANADA, July 2nd & 3rd,
NINETEEN HUNDRED FOURTEEN

New York.

THE AMERICAN SOCIETY OF ORTHODONTISTS

FOURTEENTH ANNUAL MEETING
HELD AT
TORONTO, CANADA, July 2nd & 3rd,
NINETEEN HUNDRED FOURTEEN

Dates and Places of Meetings of The American Society of Orthodontists.

First Annual Meeting held at St. Louis, Mo., June 11, 12 and 13, 1901.

Second Annual Meeting held at Philadelphia, Pa., October 8, 9 and 10, 1902.

Third Annual Meeting held at Buffalo, N. Y., December 31, 1903; January 1 and 2, 1904.

Fourth Annual Meeting held at St. Louis, Mo., August 29, 1904. At this meeting only routine business of the Society was transacted. There being no other program the proceedings were not published.

Fifth Annual Meeting held at Chicago, Ill., September 29, 30 and October 1, 1905.

Sixth Annual Meeting held at New York City, December 27, 28 and 29, 1906.

Seventh Annual Meeting held at Detroit, Mich., October 2, 3 and 4, 1907.

Eighth Annual Meeting held at Washington, D. C., November 5, 6 and 7, 1908.

Ninth Annual Meeting held at Cleveland, Ohio, October 4, 5 and 6, 1909.

Tenth Annual Meeting held at Denver, Colo., July 13, 14 and 15, 1910.

Eleventh Annual Meeting held at Boston, Mass., September 20, 21, 22. 23, 1911.

Twelfth Annual Meeting held at Chicago, Ill., July 1, 2 and 3, 1912.

Thirteenth Annual Meeting held at Chicago, Ill, June 30, July 1, 2, 1913.

Fourteenth Annual Meeting held at Toronto, Canada, July 2 and 3, 1914.

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President's Address.

American Society of Orthodontists.

By Guy G. Hume, *D.D.S., Toronto, Canada.*

Mr. Vice-President and Members of The American Society of Orthodontists:

As this is the first time the American society has held its meeting outside the borders of the United States we, as Canadians, wish to express to the members of the society our appreciation of the honor done us in holding the meeting this year in Toronto, and we trust the members will enjoy their stay while in the city. Personally, I wish to thank the members for electing me to the office of president.

It is not my purpose to burden you with a lengthy address, but simply to call your attention to one or two features relating to our association. First of which is the time of holding our annual meeting. The time should, I think, be changed on account of the danger of encountering intense heat during the month of July. We should not be subjected to the inconvenience of traveling under such conditions, nor do I think we should be influenced by other associations in choosing our dates of meeting. For the last two years the dates of our meeting have been selected and subsequently changed on account of conflicting with dates of other societies. As they changed their dates this year, we had to change ours to conform to the resolution passed at our last meeting, thus necessitating our meeting on the United States national holiday, July 4th. Some members wished to have the dates again changed this year, but a vote of the Executive Committee decided that we should ad-

Reprint from Items of Interest

here to our resolution passed at the last annual meeting. We are an independent organization and we should meet irrespective of other societies. Our object is to work and get the most out of our association with one another. This meeting should not be just the beginning of a holiday. In future when the place of meeting is chosen, I think the time most suitable for that locality should be decided.

As to our membership, we find that the society is in a very healthy condition. Although three members handed in their resignations last year, we find a goodly number making application for membership. The fact that our constitution now calls for a more rigid examination of new members, eliminates any possibility of individuals being elected to whom any objection could be taken. We do not aim at numerical strength, but each member should endeavor to bring into the society individuals who would be eligible for membership. This society always extends an invitation and grants the full privileges of its meetings to any and all who are interested in the study of our particular specialty.

Our society is to be congratulated on having such an excellent program as has been prepared for us—one of the features is the large number of "Cases To Be Reported." We trust those taking part in this section of the program have kept in mind the suggestion as to "failures." We all want to hear of the other fellow's failures. If we recognize wherein we fail we will probably learn more than from our successes. The best results of a meeting, however, must depend on the combined individual efforts of all the members to take part in the discussions of the papers presented and not leave it just to a few.

Research Work.

Few of us are endowed with the faculty of carrying on such work as has been done by Dr. Dewey—but such work must be recognized as being of the highest scientific order, and is greatly to be commended. We trust that Dr. Dewey will give us some report of the progress that he has made since last year, and enlighten us on any further information he has gained regarding "The Opening of the Intermaxillary Suture."

In reviewing the recent progress in our work—possibly the mechanical application of force stands foremost. The valuable paper given to us last year by Dr. J. Lowe Young, and the most exacting technique as demonstrated at that time by him, has probably interested more of the members of our society than any other phase of our work during the last year. This subject will no doubt receive its merited attention in its place on the program of this meeting.

Terminology.

A report which will be made at this meeting on "Terminology" should be thoroughly discussed by all. Different terminology is being used at the present time by various members of our society, and it is most desirable that all should conform to the use of the same terms, so that there will not be misunderstanding and confusion. In different scientific bodies we have from time to time suggestions as to the use of terms other than those which have probably been in vogue for some time, because the new terms are more expressive or more scientific. In reviewing the work of the Committee on Nomenclature of the Institute of Dental Teachers, we find no terms relating to our particular subject have been mentioned, so that when the committee which was appointed at the last meeting makes its report, the members of the society should give every consideration to the suggestions made therein. It is only by acceptance of new terms by societies such as ours that a change in terminology will be adopted by the profession. Individuals cannot do it. And in anticipation of the report to be made to this society, I would suggest that we co-operate with the Committee on Nomenclature of the Institute of Dental Teachers, and if new terms are adopted by this society, that we ask the Institute of Dental Teachers to add such terms in their Glossary. If we could arrange with the teachers in the different colleges to use new terms we adopt, there could be no better way for the furthering of our aims. This leads me further to say that this society should take some active interest in the education and training of those who study the subject in which we are most interested. In the majority of dental colleges this subject is not given sufficient time. I contend that all students in dentistry should have as thorough a course as possible. The demand for service is ever increasing and at the present time there is only one place of which I know that is giving a post-graduate course. I believe if our society would act the authorities of the schools could be made to realize that more time should be given to this subject in our dental colleges. This matter is of vital importance. I venture to suggest that our society go into the matter of dealing with post-graduate work so that graduates may have an opportunity to further their studies and be given the very best instruction. If it were possible, some place should be chosen where a continuous clinic could be carried on as it is most desirable that those studying should be given as much clinical work as possible. Could we not arrange a joint clinic along with other "post-graduate work" in dentistry, where there would be good hospital equipment and good clinical material associated with work in pathology and histology.

Discussion of President's Address.

Dr. D. Willard Flint, Pittsburgh.

As our president has just said, to-day we are meeting in a foreign country. To many of us it is just like coming home. It may be a coincidence, but Dr. Rogers, of Boston, is a Canadian, and as two Canadians, Dr. Young and myself, have been appointed to open this discussion, it seems to me it is pretty much all Canada for the first round. It is twenty-three years since I first met Dr. Hume on the football field, and to-day we meet again in the quest for knowledge; a different kind of game.

The first point the president brought up was as to the time of our meeting. This is a much debated question and always will be because we cannot suit every member, and there are good reasons why we are meeting here at the present time. I think there is a resolution with reference to next year's meeting place, so that we cannot discuss that part of the address. I believe by resolution the association has already decided to go to the Coast in the year 1915.

With regard to nomenclature, we have a good many old heads in our Association and it is pretty hard to get them to give up some of their pet terms because they have used them during their professional lives, and I imagine we will have a worse battle over terms than over anything in our society, because some people do not wish to yield in that respect.

Dr. J. Lowe Young, New York City.

Our president has called attention to the advisability of selecting a more suitable time for our meeting than the forepart of July and with this I most heartily agree and wish to amplify. We have but one meeting a year and it should be the object of every member to give and receive as much information on the subject of orthodontia and collateral branches as is possible, if we hope to keep pace with the rapid progress of our specialty. It is questionable if any of us are at our best at the beginning of our vacations; if we were we would not require a vacation.

Excessive hot weather is very depressing and we usually have a hot spell the forepart of July. Let us hope for cool weather during this meeting.

I am also very much opposed to this body changing its date of meeting so as not to conflict with the meeting of some other association, or to be just before or just after some other dental meeting. When a time of meeting is selected let that be final.

Post-Graduate Work.

I do not agree with our president when he suggests that this society might engage in post-graduate work. I am convinced that for graduates of dental colleges to be qualified to specialize in orthodontia, it is necessary that they should take a course of such length and such thoroughness in all its details that it will be impractical for this or any other society to give such a course. I trust that the time is not far distant when some dental department connected with one of our universities will take this matter in hand and establish a post-graduate course, and that it will be conducted on broad and scientific lines, and that there shall be a continuous clinic under the supervision of a competent orthodontist who will be paid salary enough so that he can give up his entire time to this clinic and to scientific research work. This course to be thorough should extend over a full college year, and a degree might be created and conferred on those qualified to specialize in orthodontia. It is rare indeed for a general practitioner to be found qualified to treat malocclusion, except of the simplest kind. I am a firm believer in specialization, and for this to continue we must have a place to properly prepare men or women to specialize.

Dr. B. E. Lischer, St. Louis.

I desire to discuss just one point in the president's address. I am very glad to note that he refers to the educational problems, and that our discussion of them this year is so in earnest. I wish to recall at this time that I referred to them last year, that I emphasized the fact that our specialty merits full university recognition. It seems that Dr. Young agrees with me this morning on the subject of education. I believe this society ought to appoint a Committee on Education, which could co-operate with similar committees from other bodies, and thus mold the educational tendencies of the entire country—in so far as our specialty is concerned. It seems to me that we owe this to our specialty, to our society, to ourselves and to the young men who are to follow us.

Dr. C. A. Hawley, Washington, D. C.

I am heartily in accord with the recommendations in the president's address, but many of the points he raised are to be discussed at another time. For instance, we have a committee who are to present a report on nomenclature, and I presume from the personnel of the committee the report will be a complete one.

The time of our meeting is set for next year. So far as this time of meeting is concerned—that is, at this time of the year, I think that has been discussed from year to year pretty thoroughly, and it is impossible to set a time that suits everybody. If we set it for September or after vacation, we find the different members commence their work at different times; some the first of September and some the first of October, according to locality, and no one time is convenient to all. We have had some of our best meetings in the middle of the professional year, along about January. If the members of the association were not scattered over such a vast territory, I think that would be one of the best times we could possibly meet, but it means to many a trip of three or four days in length, and to meet at such time takes a great deal of valuable time. It seems to me this is really about the best time we can possibly meet; it is in the early part of July; our work is generally finished; it is the time of the meeting of the National Dental Association when many of us have to make a trip, and it is about as suitable a time as we can find.

The president's recommendations in regard to education, I think, are very *apropos*. The recommendation of this association to the colleges should have some weight and it should have a definite plan. I think the suggestion is a good one that we have a committee on education or a council, as it has been called, which can make suggestions when called for, and make a sort of recommendation as to what is desirable in an undergraduate school. If a degree is to be given, what is the plan or the course of study? I think a council would do very good work along that line.

Dr. Hume. As to this society taking up post-graduate work, my idea in suggesting it was to bring out the point alluded to by Dr. Lischer of having a committee appointed to thoroughly investigate and report upon post-graduate work. I do not know that our association, as an association, should adopt post-graduate work.

The other points have been discussed so thoroughly that I really can think of nothing further to say.

The Practical Application of our Knowledge of the Resorption of the Roots of Permanent Teeth.

By Rodrigues Ottolengui, M.D.S., D.D.S., LL.D., New York.

Last year it was my privilege to call the attention of our members to the fact that roots of the permanent teeth, notably the incisors, may be resorbed, the phenomenon very much resembling the normal physiological shortening of the temporary teeth, especially as in both instances the pulps remain alive.

In the course of my communication of last year I described and illustrated various types of root destruction, dividing these into physiological and pathological. In regard to this I said:

> "By physiological resorption I mean that resorption of a root which occurs as a part of the normal routine, as when the roots of deciduous teeth resorb to accommodate the erupting successor. There is one marked clinical fact to be noted in regard to physiological resorption, and that is that the pulp of the deciduous tooth, though shortened with the root, remains alive.
>
> "By pathological resorption I mean a resorption inaugurated by some outside interference with the normal routine. There are several distinct kinds of pathological resorption, which are accompanied by clinical aspects, which are fairly constant when studied with the X-ray."*

As examples of pathological resorption I exhibited radiographs of roots shortened as a result of alveolar abscess, and in another instance due to the presence of an extensive tumor. I mentioned that I had known of cases where erupting third molars had caused resorption of the distal surfaces of second molars, but at that time I had no case which I could show. Through the courtesy of Dr. Theodore Blum, I am now able to give you the pictures and clinical history of such a case.

---

*Items of Interest, May, 1914, page 335.

Pathological Resorption.

The patient had reported excessive pain in the third molar region and was referred by his dentist to Dr. Blum for a radiographic diagnosis. Fig. 1 shows the radiograph in which the impacted third molar appears to be impinging upon the distal side of the second molar.

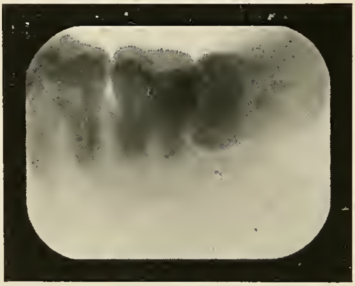

Fig. 1. (Theo. Blum)

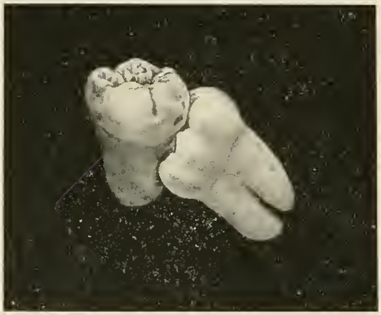

Fig. 2.

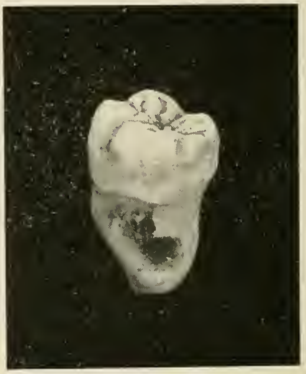

Fig. 3.

It is, of course, to be recognized that the actual positions of teeth as seemingly disclosed by radiography, may be more or less deceptive. It is very doubtful that there was any actual contact between these teeth I allude to this particular point, because last year I said that this type of root destruction may be called "traumatic." By traumatic we usually conceive the idea of an injury resulting from a blow, and, of course, a third molar cannot strike a second molar, as a hammer strikes a nail. But I take it that an injury following an actual blow is not a result of the impact of the striking object, but is rather due to morbid processes set up by the force exerted by the blow. Thus if a man have his fingers crushed between two rollers in a rolling mill, the injury can as properly be called traumatic, as where they are crushed by a falling heavy weight. Similarly, I think, we may consider the destruction of one tooth root by the forces of eruption of an approaching tooth to be traumatic in character, quite as appropriately as where the root destruction follows an actual blow.

I think, therefore, that in the case of the molars in question, we need not look for actual contact, to account for the resorption of the stationary tooth, but we may believe that the destruction is due to morbid processes set up in the path of the moving tooth. It is singular, however, and must have some clinical significance, that the destroyed area seems to assume the exact form of the approaching tooth surface.

Dr. Blum's diagnosis was that the approaching third molar had caused resorption of the second, to an extent involving the pulp, thus accounting for the neuralgic pain. Both teeth were extracted, and in Fig. 2 I show them to you placed in contact, to indicate how closely the destroyed area in the second molar matches the shape of the cusps of the third. In Fig. 3 we see the distal surface of the second molar, and the extent of the resorption.

Resorption of Implanted Teeth.

The subject of tooth implantation is one that should very greatly interest the orthodontist. If this operation could be safely conducted it would solve many problems for us. Unfortunately, the length of time which may be reasonably counted upon for the retention of an implanted tooth is so problematical, that the operation is a questionable procedure.

It has heretofore been my belief that the eventual loss of the implanted teeth is due to some traumatic injury. There is little doubt that any extra impact, whether from an actual blow, or by biting through some hard substance and thus suddenly bringing the incisive edge of the implanted member against that of its antagonist, might excite an active osteoclastic action which would rapidly destroy the root. With the evidence that I am about to submit I must add to this theory the view, that implanted teeth are constantly receiving traumatic blows, slight in degree of stress perhaps, but destructive in their effects, because of the fact that, the implanted tooth having no periosteal cushion to protect it, is unprepared to resist the forces of mastication. Under such circumstances the implanted root is constantly and progressively resorbed till lost.

Fig. 4 is a radiograph, taken June 19, 1913, and was shown last year. This tooth had been accidentally removed from its socket, and because of the youth of the patient, I recommended replantation, and with the consent of the dentist and of the child's parents, I performed the operation about one year prior to the making of this radiograph. I would once more call attention to the difference in appearance of this root and the adjacent roots. I believe that sound roots cast more distant shadows because of the presence of the cementum, and that when this is wholly or partly lost by resorption, as in the case of implanted teeth, we have a lessened resistance to the ray, and a consequent reticulated appearance.

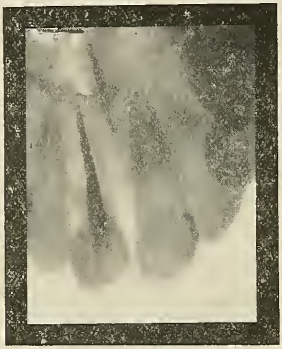

Fig. 4. (Ottolengui)

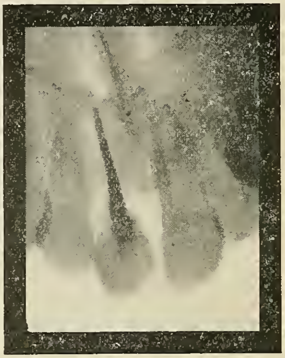

Fig. 5. (Ottolengui)

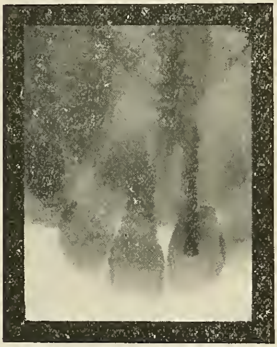

Fig. 6. (Ottolengui)

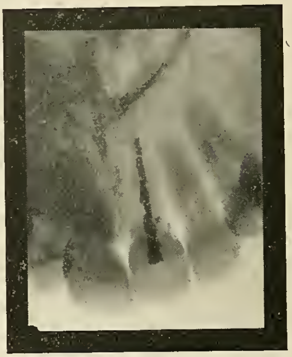

Fig. 7. (Ottolengui)

Fig. 5 is a radiograph of the same tooth taken May 2, 1914, and I think proves conclusively that the resorption of this root has been progressive, and that consequently the future of the operation is most discouraging.

Fig. 6 was also shown last year. It was taken on March 4, 1913, about two years after the tooth had been replanted by another practitioner. The attachment of the root through osteoclastic resorption followed by the building in of new bone is well shown. Quite by accident the apex of the adjacent lateral incisor appears in the field and seems to be intact and fully formed.

Fig. 7, a radiograph of the same case taken March 12, 1914, shows that here again the resorption of the central incisor root has been progressive, and that prognosis predicates a final loss. But of still greater interest is the apparent shortening of the lateral incisor by resorption. The loss is slight, and may be doubted by some. But I have three radiographs taken at varying times from March 12 to May 7, and in all the apex of the lateral seems to have suffered. However, it will be interesting if possible to obtain radiographs again a year from now. Indeed, it would be most instructive if we might have annual radiographic records of a large number of implanted or replanted teeth, and those who still have confidence in the operation would be serving science and future patients by having such records made.

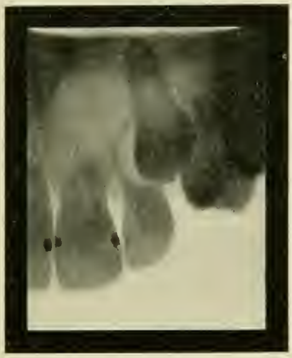

Fig. 8. (Schamberg)

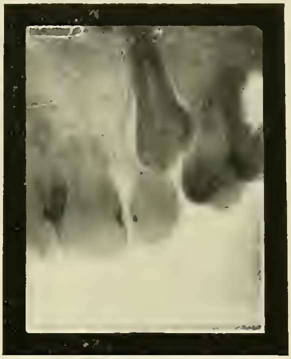

Fig. 9. (Ottolengui)

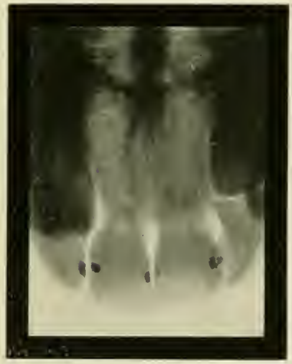

Fig. 10. (Schamberg)

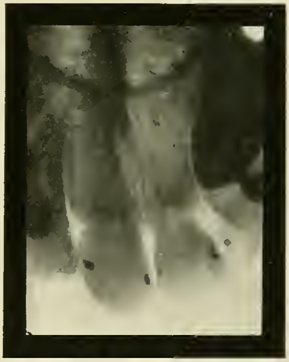

Fig. 11. (Ottolengui)

In the discussion last year Dr. Dewey, speaking of the resorption of living permanent teeth, said, "It would be interesting to find out in these cases whether the resorption stops or progresses until the whole tooth is lost." In the case from my own practice reported last year, I recorded the fact that on the left side the lateral incisor was finally lost, or rather extracted, because of the eruption of the cuspid. The root of this lateral had entirely disappeared. The condition in the region of the central incisors, and of the right lateral and cuspid, however, may have some clinical significance.

Fig. 8 is a radiograph showing right lateral incisor, and also the right central and cuspid, taken by Dr. Schamberg October, 1910, which may be compared with Fig. 9, a radiograph taken by the writer on April 25, 1914. Fig. 10 shows a radiograph of the centrals taken by Dr. Schamberg in October, 1910, and Fig. 11 shows a radiograph taken by the writer in April, 1914. Here we find that the cuspid has advanced very little, and while the lateral root is a little shorter, the centrals seems to be about the same. It is noteworthy that these teeth are somewhat protected from the stresses of mastication, owing to the fact that they are in infra-occlusion to such an extent that they cannot be made to touch the lower incisors.

Before proceeding to the consideration of my actual text, I beg the privilege of recording a few more cases of root resorption which have been brought to my notice during the current year.

Dr. Ketcham's Case.

The following history, accompanied by radiographs was sent to me by Dr. A. H. Ketcham, for an opinion.

"The patient is a lady, thirty years of age; temporary cuspid root had been crowned, over which is a chronic alveolar abscess. She was sent to me for diagnosis by the means of the X-ray. At the first sitting I made two exposures (Figs. 12 and 13), which show the impacted cuspid and the apex of the central incisor root apparently lying posterior to the crown of the cuspid, and, apparently, absorption of the lateral incisor root end. I hesitated about making a positive diagnosis without further radiographs, so made the two exposures seen in Figs. 14 and 15. These show that there is a layer of bone between the apparently absorbed lateral incisor root and the cuspid, forming the cuspid crypt. Then I remembered having made radiographs of a case—a lady of mature years—in which a bicuspid had apparently run against the hard floor of the antrum and stopped forming instead of following its usual course and perforating the floor of the antrum. This is illustrated by Figs. 16 and 17, made from two films which were placed face to face in a package for exposure.

"So the question has arisen in my mind, is it not possible in rare instances that a tooth root when forming, upon pressing against a hard substance like the dense bone forming the crypt of a tooth, or the floor

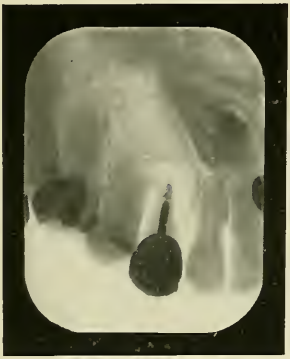

Fig. 12. (Ketcham)

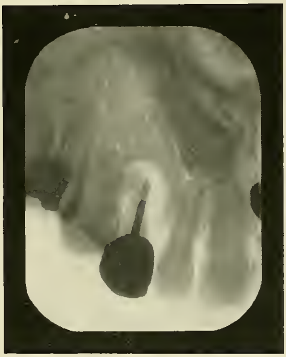

Fig. 13. (Ketcham)

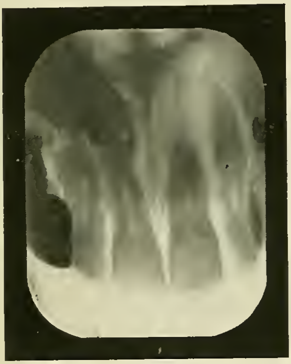

Fig. 14. (Ketcham)

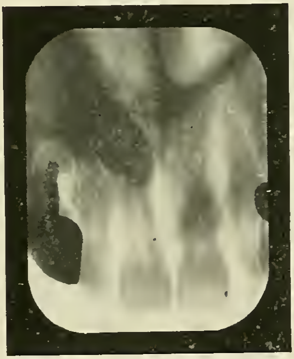

Fig. 15. (Ketcham)

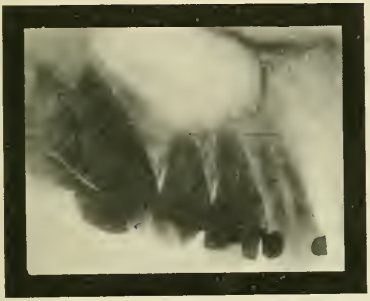

Fig. 16. (Ketcham)

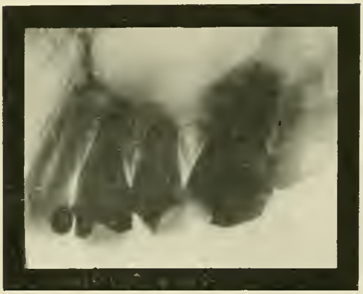

Fig. 17. (Ketcham)

of the antrum, may be arrested in growth and instead of showing absorption of the roots, the radiographs show arrested development?"

This case differs from any so far reported because we have the erupting cuspid, as in other case, but likewise we have an extensive alveolar abscess on an adjacent root, so that the lateral seems, as it were, to have been "between the devil and the deep sea." Believing that something might be determined by the condition of the pulp, I wrote and asked whether or not the pulp in the lateral had died. Dr. Ketcham replied as follows: "Dr. Howell tested the lateral incisor having the resorbed root end, and without knowing his conclusions I tested it. Our diagnosis is vital pulp." From this fact it is my view that the destruction of this root has not been caused by the nearby alveolar abscess. The clinical picture is different also, because where resorption results from an infectious condition, we find the alveolus itself likewise resorbed, whereas in this case it is intact close to the resorbed end of the lateral root, thus resembling physiological resorption of temporary teeth.

Dr. Howell's Case.

At the request of Dr. Ketcham, Dr. J. L. Howell, of Denver, has kindly sent me the following history. Unfortunately the radiographs could not be found.

"Miss Margaret McDonald, aged nineteen, when twelve years old had her left temporary upper cuspid knocked out by a blow in the mouth.

"The left lateral evidently moved back in the place of the cuspid.

"When the patient applied for treatment the left central was very loose: owing to the fact that she had had a blow in the mouth several years before, I assumed that the central had been fractured at the same time.

"On opening into the pulp chamber, I found the pulp alive, and after removing the pulp I discovered no root to the central, no more than in a deciduous tooth that is almost ready to come out.

"I also discovered a hard substance which proved to be the cusp of the cuspid."

Dr. Hoffman's Case.

At the request of Dr. Ketcham, Dr. Henry F. Hoffman, of Denver, sent me the following history:

"Dr. Ketcham tells me that you desire data concerning the absorption of the roots of permanent teeth, and requests me to report to you a case which occurred in my practice.

"February, 1898, Miss H., age 13 or 14, presented with the upper left permanent cuspid almost fully erupted labial to and in contact with the lateral incisor, the buccal teeth having moved mesially sufficiently to nearly close the space for the cuspid.

"Examination disclosed what seemed to be a cervical cavity on the labial side of the lateral incisor just beneath the margin of the gum, on the surface in contact with the cuspid. With the intention of filling this cavity before any other treatment was instituted the teeth were slightly separated and the cavity packed to force the gum tissue out. After doing this, no cervical wall could be found to the cavity and the case was considered one of absorption rather than caries. The tooth was extracted and the entire labial side of the lateral incisor root from the junction of the cementum with the enamel to the apex, was found to be absorbed, and the pulp exposed for nearly the entire length of the root.

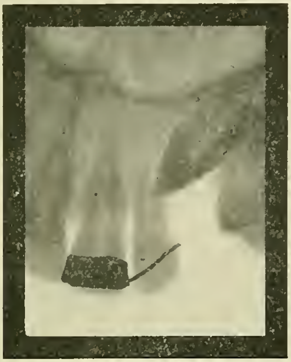

Fig. 18. (Ottolengui)

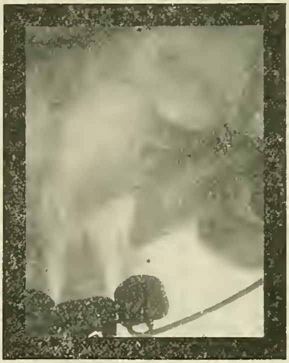

Fig. 20. (Satterlee)

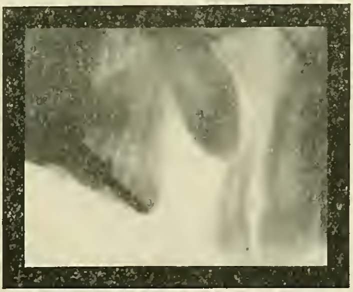

Fig. 19. (Satterlee)*

The pulp was vital at the time of extraction, and the patient had experienced no pain from it. The cuspid root showed no signs of absorption and subsequently assumed, without aid, the position of the lateral incisor.

"Unfortunately the extracted tooth and models were lost, but the case was seen by Dr. W. T. Chambers and Dr. J. S. Jackson, both of this city."

This history is most interesting, because of the fact that the cuspid erupted completely, without pain and without destroying the vitality of the pulp of the lateral, in which respect the clinical symptoms are quite different from what seems to occur in the third molar region, where we always hear of pain, either due to impingement upon the vital pulp of the second molar, or else from the death of that pulp.

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*This seems to have been printed with film reversed.—Ed.

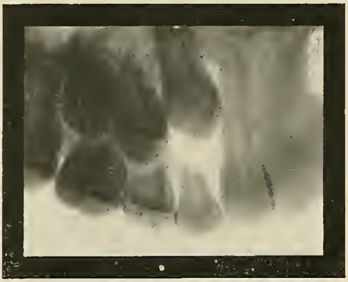

Fig. 21. (Ottolengui)

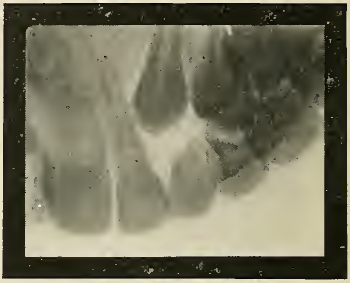

Fig. 22. (Ottolengui)

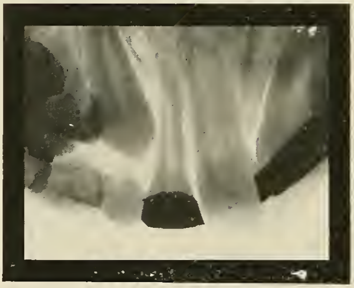

Fig. 23. (Ottolengui)

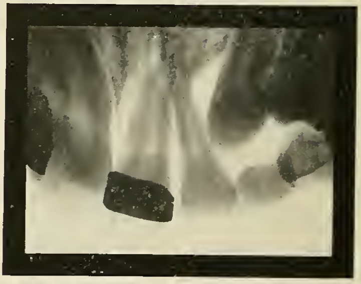

Fig. 24. (Ottolengui)

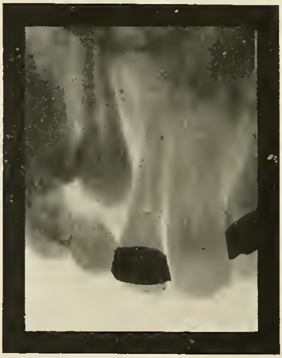

Fig. 25. (Ottolengui)

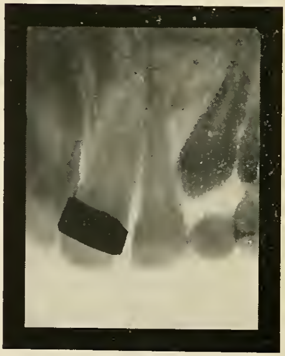

Fig. 26. (Ottolengui)

Dr. Waldron's Case.

Dr. Ralph Waldron, of Newark, N. J., brought one of his patients to me and permitted me to take the radiograph shown in Fig. 18, in which we find an erupting cuspid, and a lateral incisor root from which the apex appears to have been lost by resorption. As the case had been under treatment, I asked whether any radiographs had been previously made and he finally obtained the following from the radiographer who had made the exposures. Fig. 19 is undated, and the film clearly shows resorption at the end of the lateral incisor. Fig. 20, taken March 20, 1913, prior to the inauguration of any orthodontic interference, is somewhat difficult to read, but probably shows that the lateral root had not been fully formed at that time. In passing I should report that here, again, the pulp remains alive.

Practical Application.

We arrive at last at a discussion of the practical value of this information, collected from the records of a number of men, in which we learn at least that the apex of a lateral root may be resorbed coincidently with the eruption of the permanent cuspid; and secondly, that the central incisors, though not in the path of the cuspid, may suffer similarly. From this latter fact, somewhat emphasized by the record of the implanted tooth case where we find that the lateral root has lost its apex, I think we may conclude that an osteoclastic action once inaugurated about one tooth, may spread and cause injury to an adjacent member.

Consequently, it would seem wise, in cases of early treatment, first to obtain radiographic information as to the locality and stage of development of unerupted teeth. This will not only aid in determining the plan of treatment, but might serve as a protection in case of untoward occurrences.

Much as patients may desire rapid progress, I believe that they will appreciate conservative slowness which is adopted as a precautionary measure. In evidence of which I wish to report two cases.

Cases from Practice. Case 1.

In June, 1913, I had been treating a patient whose four upper incisors flared labially, being widely converging at their incisive ends, and apparently in close contiguity at their apices. I had reduced the coronal portions as much as possible without moving the roots apart, and as a working retainer, I placed bands on the four incisors, carrying vertical tubes. I used a labial arch, with vertical pins. These were not Angle appliances, both tubes and pins being larger. By slightly bending the arch at the median line, and then forcing the pins into the tubes, the appliance had the tendency to separate the teeth at their apices. As the patient was to be absent four months, this bending of the arch was not made very extreme, for which I was subsequently grateful.

In October last, when I saw the patient again, I found that the central incisors had assumed a fairly erect position, but the lateral crowns were still converging distally.

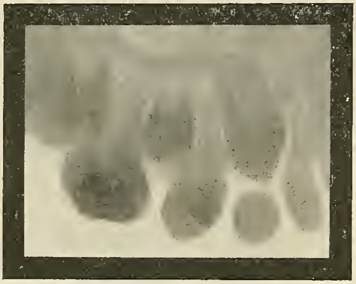

Fig. 27. (Ottolengui)

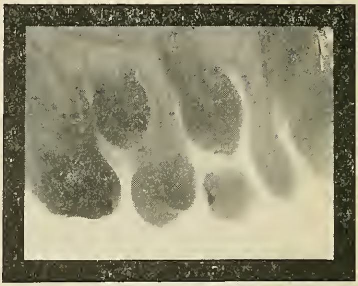

Fig. 28. (Ottolengui)

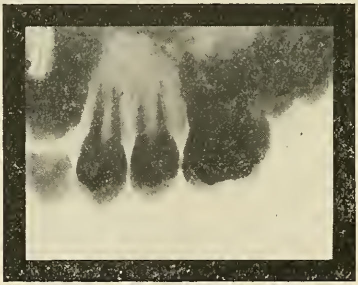

Fig. 29. (Ottolengui)

Having in the meantime presented my paper on this subject, it occurred to me that it might be well to radiograph the case. Figs. 21 and 22 show the condition and position of the laterals and cuspids right and left. These were made October 4, 1913. From a study of these radiographs, and especially that of the right side, I decided that it would be hazardous to attempt any distal movement of the lateral roots, and by explaining matters fully to the mother my course of "watch and wait" so far as this particular region was concerned, was heartily approved.

I used the new Angle appliance, with bands on the central incisors, with which I further improved the position of these teeth, by moving the apices labially, thus slightly enlarging the apical arch. Sometime in February, 1914, I deemed it safe to engage the left lateral and I transferred the band from the left central to the left lateral, slowly and carefully drawing the lateral mesially, without, however, attempting to move its root distally.

On May 9, 1914, as both cuspids were evidently approaching eruption, I made the radiographs seen in Figs. 23 and 24, made in this manner to match those made in October, 1913. I also made the radiographs shown in Figs. 25 and 26, and from a study of these I deemed it safe to remove the band from the right central, and to band in its stead, the right lateral, and then proceed to draw the lateral crown toward the central, closing the space between it and the central. At the present time all four teeth are in satisfactory position, and while no risk might have been run in moving the laterals earlier, certainly no harm, and some possible advantage has been gained by waiting.

Case II.

In another case a girl aged nine was brought to me for examination. An upper second temporary molar had been prematurely lost and the first permanent molar had drifted mesially. I radiographed the case to determine whether or not the second bicuspid were present.

In Fig. 27 we see that the second bicuspid is in the bone, but has very little root. We note also that the first bicuspid apparently has little root, and we observe that both the cuspid and the second bicuspid appear to be crowding down upon it. In an attempt to get a better view of the root of the first bicuspid, a radiograph at a different angle was made and is shown in Fig. 28. Several other exposures have been made at different times, but it seems impossible to obtain any more definite information as to the exact length or stage of development of this tooth. Fig. 29 shows the bicuspids of the opposite side for comparison, and we observe that though the bicuspid crowns are fully erupted, the root development is not far advanced. A study of this case by the models alone, and treatment based thereon, would indicate the need of immediate interference to move the drifted first molar distally in order to give room for the impacted second bicuspid. But a study of Fig. 27 shows us that the unerupted second molar lies in just such a position relatively, as was seen in Fig. 1, where we saw a third molar erupting against the second. Any forcing of this first molar backward against the second would, in my view, possibly inaugurate resorption of the distal surface of the first molar. Believing, therefore, that it would be safer to undertake this a few months later, by which time the second molar crown may have advanced sufficiently to bring its enamel surface against the enamel of the first molar, and also considering that further development of the first bicuspid root might render operations in that region safer, I have advised delaying work until next autumn. Perhaps I am unnecessarily cautious, but I believe in the soundness of my position in these two cases. And while I still am an advocate of early treatment, I am of the opinion that such treatment will be more wisely and successfully administered if checked up and guided by radiography.

Discussion of the Paper of Dr. Ottolengui.

Dr. F. C. Kemple, New York City.

I hardly know how to discuss this paper. There is so little that is definitely known about root resorption that we can do little more in a discussion of the question than to theorize as to its cause; but when we meet it in practice we sorely realize its effect. The essayist has given us in this paper additional clinical facts as he has collected them, but he has been unable to throw any light on the cause. The problem remains to be solved, and until it is solved, root resorption must stand as a serious obstacle in the way of successful treatment of a certain class of cases of malocclusion. The percentage of cases in which it becomes a factor is great enough to make it a question of considerable importance, and I express again the hope that Dr. Ottolengui will continue to collect clinical facts bearing on this subject and that he will present them to us in future papers.

The fact that the pulp continues to live during the resorption of the roots seems to indicate that the process might be identical with the process of resorption of deciduous tooth roots. As far as trauma is concerned in this process it may be a factor in a few cases. Excessive stress from occlusion on one or two teeth is, in my opinion, a very great factor in stimulating the rapidity of the resorption process when it has once started, and I believe that excessive stress of occlusion alone, if it is continuous for any considerable time, is sufficient to start the resorption.

The radiographs that were thrown on the screen all show the crypts of erupting teeth to be in close proximity to the roots that are being resorbed. The resorption in these cases may be caused either by the slight pressure created by the follicle surrounding the crown of the erupting tooth, or it may be the action of the crypt itself. It is possible for very slight pressure to stimulate a giant cell activity in the root that will destroy it, just as it is possible for slight pressure of soft tissue in other parts of the body to cause resorption of bone. Examples of bone resorption from tumors, aortic aneurisms, etc., etc., are very common; frequently the body of the sternum will be resorbed until it is completely perforated from the slight pressure produced by an aortic aneurism. There seems to be a similarity between these two processes, and it might throw some light on the subject if our pathologists could examine specimens of both and note the possible relation.

One of the disappointing features of this process in the cases that have been under consideration is that in some of them the resorption seems to be progressive even after the pressure has been relieved and all disturbing causes apparently removed. It may not be as rapid, but in one or two of the cases referred to by the essayist it was continuous to the point of the tooth being lost. In such cases, instead of allowing the resorption to continue, I have thought it might be good treatment to amputate the resorbing portion of the root. By an operation of this kind the giant cells that are causing the trouble could be removed, a healthy wound would be created and further destruction of the root might be prevented. Such an experimental operation is, in my opinion, entirely justifiable in all cases where the resorptive process is obstinately progressive.

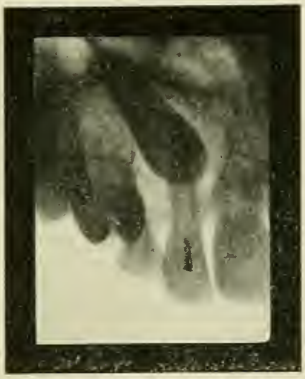

Fig. 1.

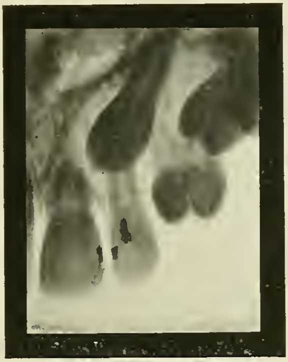

Fig. 2.

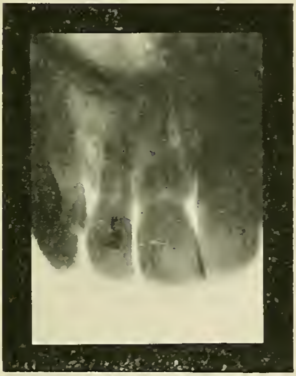

Fig. 3.

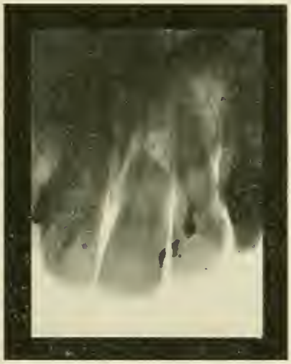

Fig. 4.

Description of Illustrations.

In Fig. 1, the crowns of the cuspids were erupting in a diagonal position in front of the roots of the laterals, and were pointed toward the apices of the roots of the centrals. The centrals were not being moved; they are not attached to the appliance, but, nevertheless, they became very loose and I became much alarmed. Pins had been set in the crowns of the cuspids and they were being moved distally, away from the roots of the centrals. The illustration shows the resorption of the root of the central, while the root of the lateral is practically intact and not affected so far as we are able to tell by the radiograph. The laterals were tipped labially by the crowns of the cuspids passing in front of their roots. The crowns of the cuspids, judging from the X-ray, are much closer to the roots of the laterals than they are to the centrals, and yet it is the roots of the centrals that have suffered.

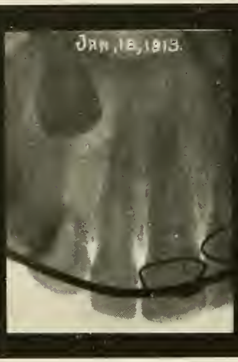

Fig. 5.

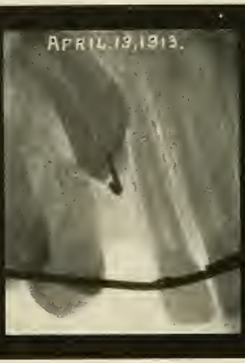

Fig. 6.

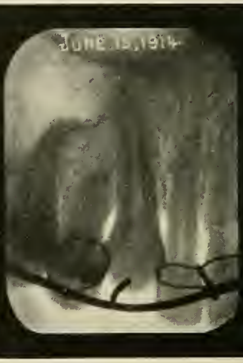

Fig. 7.

Fig. 2 shows the right central and lateral of the same mouth.

Dr. Federspiel. How old was that patient?

Dr. Kemple. About fourteen. Figs. 3 and 4 are radiographs of the same case taken only a few days ago, and seem to show the resorption to be progressive.

A Member. Were the teeth ever fully developed?

Dr. Kemple. I cannot say, but I should assume that they were. Fig. 5 was made in January, 1913; the patient was fourteen years of age; the left deciduous cuspid was in place and showed only slight resorption. The crypt of the erupting cuspid is fairly well outlined, and the apex of the root of the first bicuspids has begun to resorb. Fig. 7, the third of this series, taken June 13, 1914, shows fairly well the amount of resorption and does not indicate that the destruction in this instance has been perceptibly progressive.

Dr. Ottolengui. How do you account for the light area over the bicuspids?

Dr. Kemple. I believe the light area marks the location of the permanent cuspid before it was moved. The cancelous tissue here has not yet become as dense as in the other portions where it has not been disturbed.

Dr. Federspiel. What is the age of that patient?

Dr. Kemple. Between fourteen and fifteen years when the first radiograph was made. In this case, if the resorption of the root of the first bicuspid were shown to be progressive, I believe it would be a justifiable operation to amputate the apex.

Dr. C. J. Grieves, Baltimore. I have been working on a similar line in relation to the resorption of the cemental apex in pulpless teeth, with much the same results as Dr. Ottolengui shows here to-day. Some of these cases were reported in Philadelphia, but I do not care for these to appear in print yet, as the findings have not been verified.

I believe that the cementum of the root of every tooth, the pulp of which has been successfully devitalized and the root filled, will be found to be vital, and that if you make a section, a large part of the pericemental apex, particularly that near the peridental membrane, will be living cementum. I have been cutting many sections and have been fortunate enough to see some made by Dr. Fletcher, of Cincinnati, and I believe that in every case there is a certain amount of resorption of this cementum, and the type of resorption found is the physiological type of rounded bays, not the jagged absorption common to infected or necrotic areas. I am not speaking of infection, but of normal resorption such as occurs around the roots of temporary teeth. The reason I mention this is because the types are so similar and the pictures are very like those shown by Dr. Ottolengui.

Dr. Ottolengui spoke of pressure as one of the causes of root resorption: It occurs to me that there were no cases reported of children who were not in a way under pressure. That is the reason why they consult you; all cases requiring orthodontic treatment are at some point impacted or under pressure. The formation of normal bone is a wasteful process indeed; it is laid down only to be absorbed again and again. You have these trophic conditions in the alveolus of every patient on whom you work and it seems to me that pressure or a little more blood to the part might easily produce root as well as normal bone resorption.

Dr. Kemple's remarks regarding aneurism and his statement that the hard tissues are always subject to and under the control of the soft tissues has been amply proven, so that a soft growth like an aneurism can produce bone resorption, and we can readily understand why an advancing tooth would not necessarily need to be in actual contact, and why such stimulation of the tissues would increase blood to the parts and the absortive processes would go on, we might say normally.

The condition of the cementum directly at the pulp entrance is another feature to be noted in the slides, as compared to my slides of pulpless teeth with vital cementum. In these contrasted with those I have seen, the resorption process seems to dip down into the canal, and in the instances where I knew the pulp had been removed, there was always a "dimple" in the pericemental apex. I have seen this in adults and some of it in children in extracted teeth, although I have never had the conception that the whole root, including the dentine, might be riddled or interstitially absorbed as Dr. Ottolengui has shown it to-day; neither did I think the process was so general.

These cases occur in some children, but not in all children, and why should it not occur in every child presenting for treatment? They all come to you because they have the same pressure conditions at some point. I do not want to ride a hobby too hard, but I believe that where this resorption occurs the children are subject to calcic waste. The intake and output of calcium is unbalanced. Calcic waste is one of the great questions before the medical profession to-day. Even in adults, if we have more calcium thrown off than is retained, a very serious nervous breakdown occurs, finally resulting in tetany. Children should store calcium and when calcium metabolism is disturbed there is always some form of serious denutrition. This is the case in rickets, and many intestinal conditions of childhood, as well as marasmus, have been relieved by feeding the child calcium lactate. A great difference has also been noticed in all the nervous symptoms, as well as in the skin and hair, and I believe the bones and teeth would be greatly benefitted, but it is to be understood that this is not the old idea of forcing in a certain percentage of insoluble lime, but rather a stimulation of the whole metabolism of calcium.

Dr. V. H. Jackson. Having had much experience, and being a close observer of such conditions as Dr. Ottolengui has referred to, the implantation and replantation of teeth, I want to call attention to my discussion of the subject published in the *Transactions of the American Dental Association* (years ago), which is verified by further experience.

In the case of a tooth that is to be replanted or implanted, it is important to know how best to deal with the root.

I would first like to ask Dr. Ottolengui if he *implanted* or *replanted* the tooth he referred to, and if the root in his case was dressed away with stone or other means, or whether the peridental membrane was scraped from the root or not, or the surface left merely as Nature had prepared it?

In my previous discussion on the subject of implanting and replanting teeth and the value of the operation, I brought out the point that wherever the roots were dressed away or were injured by the use of the forceps, or other injury, as from filing, grinding or scraping the root, so as to remove the peridental membrane; or where there was injury of the apex in filling the pulp canal, that would be the point where the irritation of the soft tissues would cause absorption of the root to begin. In *The American System of Dentistry* and other text books are numbers of illustrations of roots of permanent teeth that have been implanted and replanted, showing the location and extent of their absorption.

In my transplanting and replanting of teeth I became convinced from the results, that when the tooth is extracted by the forceps which generally injures or roughens the surface of the root, if the injury is below the neck of the tooth, it becomes an irritant, and when implanted absorption starts at that point, or at any part of the root where the surface is injured, as when there is any filing of the apex of the root, the absorption will begin there first.

How does Nature retain the replanted tooth in its socket? It is supported by granulation tissue developed about it which enters the normal vascular openings of the canaliculi of the cementum, which are always present on the surface of the cementum.

Those that have been interested in the use of sponge grafting in the healing of wounds to prevent the tissues from wasting more than necessary, know how soft tissue travels through the pores of the sponge, like fingers, in sizable threads, and as these pass through the sponge in all directions they close the wound. I have often pulled on the sponge to see the network of these threads, passing into the sides of it, a few days after its insertion. As I said, if there was anything that would cause their irritation, as a roughened surface, the tissue would become abnormally congested.

Through the vascularity of the granulation tissue entering the vascular openings of the cementum, bone may be deposited extending into the openings of the canaliculi, which would cause bony ankylosis of the tooth. The latter is not an uncommon occurrence.

There is no renewal of life in the tooth resulting from implanting, except the life in the granulated points that enter the vascular openings of the root.

If the root of a permanent tooth becomes absorbed, it is the result of an encroachment upon it, causing irritation. Any irritation of normal tissue causes engorgement and brings about enlargement of the blood vessels which surround the irritated part. From irritation an abnormal amount of blood is concentrated there, with an increased blood pressure at the point, which would cause force on the inner surface of the alveolar process, and this pressure through the vascular net work of the bony portions separating the vessels would cause absorption. In other words, the vessels become swollen, which gradually breaks down the bony walls surrounding the vessels, resulting in the loosening of the tooth in the alveolus. This form of absorption is apparent when a tooth is being moved by force applied by the orthodontist.

I want to say a word about the result of operations by the rhinologist. Often the rhinologist in his effort to increase the capacity of the nasal cavity removes more or less of the bony tissue, which encroachment, near or adjacent to the root, often causes a congestion or inflammation that extends to the peridental membrane, inducing a congestion, although he may not reach the socket enclosing the root, but be some distance from it. I have known a number of cases where the removal of the bone by the rhinologist has resulted in the death of the pulp and produced more or less further bone absorption. This is important, since we know that all the tissues are subject to absorption, and as they are subject to absorption we should always discover the irritant early. If a tooth has taken malposition in its development from the germ, as growing forward in the line of the arch, it would lead us to discuss the question as to what is the force that brings about the eruption of the tooth. It is important for us to know. I think the substance of the covering of the enamel portion of the tooth after that part of the tooth is formed is a calcareous deposit, which becomes an irritant to the surrounding tissues, and the inflammatory action causes absorption of the bone or process adjacent to it, and later of the gum tissue.

In all X-ray views of non-eruptive teeth a space is shown between the enamel of the tooth and the bony covering. In other words, the deposit acts as an irritant and absorbs the bone surrounding it and permits the teeth to advance in its eruption. There being at the same time development of the root portion, this assists in forcing the tooth forward.

Irritation in these parts is naturally depended some on the physical condition of the patient.

Dr. James Ernest Walker, New Orleans.

Before the discussion is closed there are one or two points that need to be cleared up. We have heard that fibres grow into the cementum to hold the tooth in place. I do not think that is what takes place. There are fibers, but the hard tissues build around the fibers. In fact, I think there is throughout life, in normal conditions, a perpetual laying on of minute layers of cementum, in that way affecting continually new attachments of the fibres which hold the tooth in place.

The other point is the question in relation to absorption of one tooth, due to the encroachment of another. It has been said here that they are in contact. If there is absolute contact, the only way you can have any waste of tissue would be by abrasion, the mechanical wear due to the friction of one tooth upon another when in contact. It seems to me, what we have in the case illustrated is a resorption which necessitates soft tissues being in between. The tissues are irritated until the cells have taken on giant form and have caused absorption.

Dr. V. H. Jackson. For those who are interested in sponge grafting and who would like to know how the soft tissues act in sponge grafting, I will say that Nature sends out a granulation tissue like fingers, and these pass through the sponge. In my experience I have often pulled down upon a tooth and have seen the granular tissue putting out fingers, going forward and penetrating the openings, and if there is an irritant there that tissue becomes congested.

Dr. Walker. I did not have reference to the arterial loops in embryonal tissue which has just been referred to. A tooth is not held in place by these arterial or capillary loops, but by fibrous tissue. Tissue embryonal in character is seen entering resorptive areas, and it is still there when the resorption area is being refilled, but that is not what holds a tooth in place. The redeposit of cementum encases fibrous tissue which becomes Sharpey's fibers.

Dr. Jackson. Do you consider the root as dead or as having living tissue in the cementum of the tooth?

Dr. Walker. As alive. Resorption goes through the cementum into the dentin, but dentin does not refill the areas; they are filled by cementum even when in the area of the original dentin. Dentin is not built outward, but always inward by the pulp.

Dr. Ottolengui. You are speaking of autogenous natural teeth, while Dr. Jackson was talking about the retention of replanted teeth and teeth that are actually dead.

Dr. Walker. I was not speaking of implanted, replanted, nor of dead roots where we have pathologic absorption, but of physiological resorption which is under discussion and of teeth that are being regulated. This closely resembles, microscopically, the resorption which takes place in reconstruction of the alveolar process and other bone.

Dr. H. D. Keeler, Des Moines, Iowa. I am very glad to have heard this paper. I wish to mention a case of an absorbed left lateral in the mouth of a boy twelve years of age. I was in doubt whether this was a deciduous or a permanent tooth.

The crown is that of a permanent tooth, and after hearing this discussion I am positive it is a permanent left lateral with about one-third of the root resorbed.

The cuspid is mesial of normal, lying obliquely in the arch, the crown being in contact with the root of the left central, and in contact also with the left lateral, the root of which latter is one-third absorbed.

Dr. Ottolengui. I am very much pleased that Dr. Kemple presented the case which he did, because it accentuates what I said with reference to the desirability of having some radiographs taken before treatment. It must be a source of gratification for Dr. Kemple to know that the tooth which showed resorption had not been interfered with by him, and it will be a double gratification if the patient should ever lose this tooth to know that Dr. Kemple could not be held responsible.

I am sorry Dr. Grieves made some remarks and then forbade us to print them in full. It seems to me, there is a dissimilarity between the cases to which he refers and the cases which interest us, which either he has overlooked, or else did not allude to in his discussion, and that is, that these children's teeth have living pulps in them, and not only did these pulps remain alive during the progress of this disturbance, but they have remained alive after the cessation of it.

I showed on the screen in one case two central incisors, the resorption of which has not progressed in four years. Those teeth are now quite firm. In spite of the fact that they have no roots, they are perfectly healthy in color and are living teeth.

Another point I would like to accentuate is this: There is a clinical aspect in all these radiographs which differentiates this particular kind of resorption from the usual morbid resorption. In morbid resorption we not only have resorption of the root itself, but also resorption of the surrounding bone. Here we appear to have two opposite conditions progressing coincidentally. We have resorption of the root which, of course, would leave a space, were it not for the fact that new alveolar bone fills in that space, as rapidly as the root is shortened. Moreover, unlike new bone which fills into a space once occupied by a granuloma—this new bone cannot be differentiated with the X-ray, from the surrounding bone. It is this particular clinical aspect which is so similar to the resorption of the temporary teeth.

Dr. Kemple. That is a physiological process.

Dr. Ottolengui. It is similar to a physiological process, but whether it is a physiological process or not, I do not know. I do not see how it can be a physiological process, because what is physiological is according to routine plan. It cannot be according to routine plan that permanent teeth should lose their roots. There is a close analogy between this particular aspect of these two conditions, namely, the bone is built in as fast as the root is absorbed, and the pulp remains alive.

Dr. C. J. Grieves. Dr. Fletcher's slides present exactly the same condition in pulpless teeth, where the apex has not become necrotic nor infected and mine will show the resorptive areas and that secondary cementum or bone does develop; it is sometimes hard to draw the line between cementum and bone.

Dr. Ottolengui. I think we can in implanted teeth.

Dr. Grieves. Am I to understand that you distinguish between the resorptive processes and the deposit of cementum or bone that takes place.

Dr. Ottolengui. I think that the condition of the surrounding bone is quite different in infected cases, from what is seen in these cases of young teeth resorbed without death of the pulp. And I think the clinical pictures of both root and alveolar bone, in cases of implanted or replanted teeth, as again different from either.

Dr. Grieves. Fletcher shows large areas of resorption near the apex containing a secondary deposit of cementum or of bone, but they are not all large, sometimes just a bare deposit of secondary bone following up the resorption of the tooth.

Dr. Ottolengui. In conclusion, I would like to say one thing more: Heretofore we have been studying resorption by sections, always dealing with the dead subject, and our past knowledge has been based upon what the microscopists have told us that they have seen in their pictures. We have had introduced to us to-day another method of getting pictures, and these pictures are from living subjects, and while one or two or three of them may be distorted and may be deceptive, that is equally true with the microscopic slides. Some of them are most deceptive.

The vital part of the subject has not been touched on in discussion. No one has considered the question of whether to check up with radiography before deciding on a plan of treatment. So all of you gentlemen who have not had a beautiful child under your care, with two beautiful central incisors, which lose their roots while under treatment, take my advice and radiograph freely all doubtful cases before you start, and thus know the conditions.

The Causes of Abnormalities—Heredity or Environment.

By Charles E. Woodruff, M.D., Lt.-Col., U. S. Army (Retired), Co-Editor American Medicine, New York.

The investigations of recent years have brought to light many facts which may solve the old puzzle as to the relative influence of heredity and environment in the production of abnormalities. All medical men, especially orthodontists, are vitally interested in such academic studies, and it is to them we must look for facts which will lead the way to prevention. In searching for causes we will be led astray unless we keep clearly in mind some of the basic principles of heredity and development. In the first place, let it be fully realized that the great law of origin of species by the selection of favorable variations—what is commonly known as Darwinism— has been so thoroughly proved to be true that it is now the basis of all the biologic sciences. We are not yet sure about the causes of variations and it has been proved that some of Darwin's guesses are not correct, but the great law itself remains exactly as he stated it. Recently it has become almost a fad with a few writers —particularly clergymen—to state that Darwinism has been abandoned by biologists, but the truth is the opposite.

Known Facts In Regard to Specific Characters.

Briefly, the known facts are as follows. No two offspring of a pair of beings are exactly alike. Far more are born than can possibly survive, and there are many lethal agents which kill off the surplus, the survivors of this slaughter being those whose variations enabled them to escape. These survivors transmit their new traits to their offspring, which as a whole are therefore slightly different from their grandparents. By the accumulation of these minor differences generation to generation, new species arise.

Variations in Species.

The puzzle has always been to account for the variations and to explain why they are transmissible. Lamarck conceived the idea that the use or disuse of organs or parts causes hypertrophy or atrophy and these modifications are transmitted. This theory was long rejected because there was no evidence that any modification of the body or somatic cells ever influenced the germ cells in the ovary or testicle so that they reproduced a mutilation or any other modification. We have certain proof that men have lost teeth for many tens of thousands of years, probably hundreds of thousands, and yet babies are always born with the germs from which sprout all the fifty-two teeth.

Lamarckianism is beginning to be favorably considered, but it is in a sense wholly different from that theory conceived by Lamarck himself. It has been shown by many experimenters that if germ cells are acted upon sufficiently strongly mechanically or by light, heat or chemical substances, the ovum will develop into something different from the parent, and that the change in the germinal protoplasm may be permanent. That is, the ovum in its development sets aside certain cells which form the tissue of the ovary or testicle, and these cells are exact counterparts of the ovum. The germ cell has no power to revert to the type in the grandparent or in the parent before the poisoning. It has been permanently changed, but in the absence of such a poisoning, the germ cell is the same, generation after generation. This is what Weismann calls the "continuity of the germ plasm." The body is considered a mere temporary home for the germ plasm and dies as useless as soon as a piece of the protoplasm is cut off and builds up a new home for itself.

Weismannism.

Weismannism does not deny that the germ cells are ever modified in the ovary or testicle so that they develop differently from the parents. Indeed it assumes that this always happens as it is practically impossible that the blood serum which bathes these cells should be constant in composition or in its dissolved chemicals. This constant variation in the cell's environment must so prevent uniformity that no two germ cells are exactly alike. The new viewpoint is this: the modified germ cells develop into something more or less different from the two parental types—not necessarily resembling either or the mean between them. Weismannism assumes that variations of nutrition or poisoning by abnormal substances in the blood serum of the parent permanently modify the germ plasm, so that it develops a body different from the parent, and that the parts of the germ plasm which form the germ cells in the ovary of this offspring will necessarily repeat the process for the next generation. The more perfect the manner of living, the less will be these changes in the germ plasm and the more closely will the offspring resemble each other and the parental type. That is, no variation of the body is of itself transmissible. What is handed down, is the changed condition of the germ plasm, and this new protoplasm will continue to develop these new body forms as long as it is not modified by later factors.

Mutilations of the body can have no possible effect on the germ cells and are therefore never transmitted. Nor are any other modifications or acquirements of the body ever transmitted. A man may become very distorted from occupational stresses but his children are born as he was born. A man may become very learned in a certain line but the knowledge is never transmitted. Similarly, training of the body or brain, may develop that body or brain to better efficiency, but it has no effect whatever on the next generation, except that such a parent may be able to teach his children better than an ignoramus could.

By looking to the environment for the cause of every departure from the type which heredity would produce, we find that modifications and variations are identical in being due to environmental causes. The former are changes in the body due to mutilation, disease, malnutrition, etc., and, having no effect on the germ cells are not transmissible. Variations on the other hand are developmental changes due to permanent changes in the germ cells from environmental causes, and appear in later generations. Mendel's discovery shows that the union of the male and female cells does not create anything new, since the characters are transmitted as indivisible units. If a harmful modification is not fatal it does not effect the species for it is an individual matter which disappears in the next generation, but a harmful variation may eliminate that type from the accumulation of injuries, generation to generation.

There was recently a discussion as to whether these permanent changes in the germ plasm are always minute and found in every generation, or whether they occur occasionally and in marked degree. DeVries championed the latter idea and said that evolution occurs by sudden jumps due to the appearance of these big variations which he called "mutations." It is now known that one of the plants he studied (a primrose) was a hybrid and that the changes he called variations are merely reversions. The drift is now back to the original idea of Darwin that variations are minute and evolution gradual. All the controversialists agree that the changes are due to causes acting on the germ plasm, and that they are purposeless, some being actually harmful, others of benefit, and the latter have the advantages in the competition for survival.

We need not discuss Mendel's laws, as they deal merely with the manner in which the various qualities of the two parents are segregated in the germ plasm and may appear as "dominant" in the offspring or be hidden as "recessive," and in later generations may not enter the germ plasm at all. The point we are to remember is that the germ plasm is composed of a piece of the germ plasm of each parent in different proportions.

There is then no mystery about heredity. The word merely means that germ plasm does the same things generation after generation as long as it is not chemically changed by something in the environment. The mystery is the manner in which a germ cell develops the body by multiplication and specialization of the cells and their arrangement into tissues and organs. Little is known of this process, though some progress has been made in explaining it. As it has no possible connection with the process we call heredity it does not concern us here.

Weismannism does not say what the modified germ cell will produce in its development by multiplication. That can never be foretold because of the almost infinite number of changes possible in such highly complex substance, formed of many groups of molecules each containing hundreds of thousands of atoms. The forms of body produced are legion, and some of them are fitter to survive than the others, which range around the fittest in accordance with the mathematical laws of probabilities. The great advantage of Weismannism is the way it settled the baseless idea that a modification of the body so influenced the germ cells in the ovaries or testicles that they would develop into a body possessing the same anomaly.

Modifications of Bacterial Forms.

It was also an advantage to learn that heredity in multicellular organisms was identically the same as in the unicellular such as bacteria which are so easily modified by the environment. In the latter we can readily see that all modifications or acquirements are transmitted because the body is the germ cell, and after division the cells or new organisms are merely the two halves of the parent. Bacteria are very easily modified by a new environment—indeed such change is the rule, and this susceptibility makes it possible for the bacteria to revert to the original form as soon as the original environment is restored. Regeneration is the rule, and this is a very vital matter in studying the degeneration which in the human species is accompanied by so much dental abnormality.

However, there are a few instances on record where such marked change has taken place in the protoplasm of bacteria and higher plants by a new environment that they have not been able to revert upon restoration of the original environment, but remain what is practically a new species artificially produced. The smallpox germ which is probably a protozoon is also permanently changed by residence in the cow, and does not revert when it re-enters man. In this direction, research is now being directed with a view of producing vaccines for cure or prevention without the slightest risk of producing the original disease or any of its dangers or complications.

Regeneration Principle in Man.

In man regeneration is the rule even after considerable degeneration has been caused by adverse factors. That is, a man may have been so stunted or deformed in the developmental stage that we would presume the germ cells could not be normal, and yet if his infant is properly fed and managed it may develop into a normal adult. Unfortunately the uterus of a degenerate woman is a bad home for an ovum which is liable to malnutrition or poisoning from the abnormal blood serum of the mother which nourishes it through the placental membranes. Hence the offspring may start extra-uterine life already damaged so greatly that it cannot develop properly. Degenerates thus may give birth to degenerates, but it is not fair to call this heredity. The germ cell may have entered the uterus in a perfectly normal condition, and may have been damaged by this adverse environment. It subsequently develops badly, but may not reproduce a single abnormality possessed by the mother or father.

Influences of Alcoholism.

It is evident that maternal abnormality is far more effective in damaging an ovum than the paternal. This is specially evident when the mother is an alcoholic, for she poisons the germ cells before conjugation with the male cells, and for nine months afterwards. Her children become progressively more and more degenerate, until the later ones are not viable. In the last stages she aborts earlier and earlier until sterility follows.

Influences of Syphilis.

In syphilis the course of events is the exact opposite. Abortion is the rule in the early stages, but as the disease is cured the later pregnancies are longer and longer until the full term is reached but the child is not viable. In time perfectly normal children appear. This is merely an infection and has no relation to heredity—though we call it hereditary syphilis to show that the trepomenas were obtained from a parent. It would be better to call it congenital or prenatal infection.

Degeneration.

By common consent the word degeneration is applied to those in whom the nervous system is at fault, and in our ignorance of the exact chemical change which has taken place in the nerve protoplasm, we merely called it "instability," for this term expressed the most prominent characteristic. This change has first taken place in the germ cell probably from some kind of poisoning. Necessarily then it must be hereditary for at least one generation, for this damaged germ cell reproduces unstable germ cells like itself. The nervous system produced by such a damaged germ cell is so unstable that it may go wrong in any one of dozens of different ways, producing the great class of neurotics—people of every grade of intelligence from idiocy to genius, with every form of bodily defect or abnormality called the stigmata of degeneration, with every kind of nervous abnormality from hysteria to epilepsy, and specially prone to neuroses and insanity.

Now although the defect is in the germ cell and thus transmissible, it is not necessarily permanent. A congenital neurotic may possess sufficiently good and pure blood serum to restore his or her germ cells to a normal condition and his children may be perfectly normal especially if the conjugal partner is not neurotic. If both are neurotic the case is more or less hopeless for their direct descendants, though even in such cases regeneration of later generations may and often does occur. The tendency always is towards the normal. Only where the abnormal environment is continued and intensified do the lines tend towards extinction as Morel proved over a half century ago. The early writers on this subject were deceived into thinking that if in the worst cases with a permanently bad environment the course was progressively downward to idiocy and sterility, such was the rule when the environment was normal. They gave undue power to heredity and ignored the restoration effect of a good environment. We now know that the change in the germ plasm is not necessarily or even ever a permanency, but disappears or gets worse as the environment is good or bad. This would be a sad world if instability were permanent and even cumulative, for every family has more or less instability which would result in universal idiocy and sterility to end the race. The only thing really permanent in us is the normal. The good is hereditary and permanent, the bad temporary and non-transmissible as a rule.

Influences of Climate.

Morel himself was probably deceived by studying misplaced migrants who were in a climate to which they were physically unadjusted. Extinction is the invariable rule in such cases, and the time required depends upon the degree of unfitness. It may take only three generations as in the Anglo-Saxon in India; several generations as in the blond French in Louisiana; or several centuries as in the blond Homeric Greeks. The process is invariably accompanied by nervous instability which is most marked in the blonds who wander from their normal cold, dark, northern climate to one which is hot and light, but the cause is the constant bombardment of adverse factors for which they have no physical protection such as pigment in the skin.

Arrest of Development.

Very frequently the results of arrest of development are erroneously considered to be evidence of direct heredity when they appear in two or more successive generations. Any one of a thousand adversities may check the growth and development of a young ovum, foetus, infant or adolescent, and the results vary according to the stage of development when the injury was received. Arrest may occur in one or several parts so that the children though dreadfully deformed may not have the same deformities as the parents—if the parents are at fault. Unfortunately the jaws are very prone to arrest of development from any of these causes, and the process is the same in all cases where the arrest is the same in time and degree. That is, if I am not greatly mistaken, the permanent teeth come in abnormally almost according to a rule instead of absolutely at haphazard. Thus it happens that certain deformities are found in two or more generations as though they were hereditary, whereas there may have been separate causes for each generation and no hereditary influence whatever.

A few years ago, dental deformities were considered an invariable sign of an hereditary nervous instability which rendered normal development impossible. It is no doubt true that a neurotic organism is easily disturbed by an injury which is harmless to the normal. Hence among the deformed there must be more neurotic types than in the population as a whole, but we have gradually drifted away from that extreme position and in every case we are searching for the special cause which pushed the organism out of the rut it would have followed if its normal heredity had been allowed to work out its destiny. We have long ceased to consider every degenerate a result of heredity. This has been proved by a study of the one bad specimen which now and then is found in a larger family of normal children. A French investigator has asserted that in every case where an idiot is found in a large family of normal children, it was discovered that something quite serious had happened to the mother about the time of conception or during early pregnancy—an attack of typhoid fever, pneumonia or whatnot. The ovum was poisoned by the bacterial toxins and the result is practically the same as in experimental poisoning of lower animals and plants.

Influences of Tuberculosis.

It was announced some years ago, that the tuberculous gave birth to far more sexual perverts than the rest of the population. This sounds reasonable, as the toxins of the tubercle bacillus have a profound influence on the sexual system of the parent, and we could guess that they also affected that of the foetus. In such cases the mother is mostly at fault because she poisons the foetus for nine months, but an infected father must also have some effect as his spermatozooids are also poisoned.

Criminality.

All these principles are illustrated in the curious changes in our opinions relative to criminals whose anti-social actions show that they are far from normal and must have been made abnormal by the environment. The ancient idea of mere viciousness was intensified when Lombroso stated that possibly thirty per cent. of criminals are born so, and that moral reform is impossible without reforming the brain and body. Then we shifted to the opposite opinion when we learned that fully 80 or 90 per cent. of young criminals could be morally reformed by proper institutional training and then lead a normal life of good citizenship. We concluded that crime was largely a matter of teaching in a bad environment. Then we shifted again when we found that in the Iowa State Penitentiary over ninety per cent. of the criminals came from respectable families. They had a good heredity and were raised in a presumably normal environment. Criminals give birth to very few criminals as the family life is impossible in their calling. The idea of sterilizing criminals to prevent the criminality of the next generation is sheer nonsense.

The truth as to the origin of criminals has only recently been found. Binet's test shows that they are almost invariably cases of arrest of brain development. They are mental children with the moral ideas normal to children or savages of their grade of development. Prostitutes are the female counterparts of the male criminal and are all more or less feeble minded. That is, something has happened to the parents to poison or injure the ovum and prevent its developing normally. Perhaps only one of a large family becomes a criminal, the rest having had normal development.

Present inquiries are in the direction of finding out what has happened to cause this arrest of development, whether an infection, poisoning by alcohol or other drug, poor nutrition, fatigue or any one of dozens of other adversities. My own personal inquiries have shown that the cumulative effects of a bad climatic environment cause inefficiency from neurasthenia, and that the type most out of adjustment to any one locality furnishes an undue proportion of paupers, criminals and insane. That is, criminality is not hereditary but due to the damage of a bad environment before or after birth.

It is true that a case of arrested development will be more easily damaged by the environment than a normal child. We all know of prominent men who have done well even though born in the slums. If a family is so degenerate that it drifts to the slums, the next generation is generally more degenerate from the accumulated effects of the same causes and is later damaged by the slums also. The neurasthenic or unstable nervous system is transmitted as we have already explained, but it may result in genius not criminality, and in addition it may disappear in later generations if a perfectly normal environment is supplied immediately after birth.

Criminals show the effects of bad development in their physical anomalies. I once examined two or three hundred young criminals and found barely six who could pass the physical examination of a recruit in the army and navy. In only two were there no discoverable defects whatever. This seems to be the rule in all classes of abnormal men. The teeth in particular were very bad, both from neglect and defective development of the jaws. Soldiers are as nearly the average normal man as it is possible to get them, physically, morally and mentally. They contain fewer degenerates than any other class.

When the germ cell has been so seriously damaged that its development is checked soon enough to cause idiocy or imbecility, it seems impossible for a return to the normal in later generations. If feeble mindedness mates with feeble mindedness, all the children are feeble minded. In case of minor grades of the defect, mating with the normal may give some normal offspring, but the social burden of the others is so great that governments here and there are discussing the necessity of sterilizing all this class of defectives—a proposition which is sure to become law.

Heredity and Environment.

The lesson to be derived from this résumé of the present status of the effect of heredity and environment, is this: Heredity means that an unchanged piece of the germ plasm of a normal parent must develop as the parent did, and if it departs markedly from the predestined groove, something in the environment has pushed it out. Arrested or perverted development of the jaws always has an environmental cause, generally prenatal, but it may be post natal from bad nutrition or disease. Moreover a good environment (including nutrition) may restore a baby to normality which seems drifting away from it. The cause may have happened in the grand parent, so profoundly affecting the germ cells as to interfere with their development unto the third or fourth generation by a pseudo-inheritance. Finally the tendency of all organisms is to return to the normal specific form if the environment is restored to the normal, the exceptions being those rare cases where an entirely new germ plasm has been created by the environment.

It is very evident that an intensive inquiry into the family histories of cases seem by the orthodontists, will eventually result in finding the causes of the abnormalities of the teeth and be of immense benefit in prevention, not to mention the flood of light it will shed on the relative effect of heredity and environment. You will find that quite frequently, if not always, the worst cases of deformed or arrested jaws are in the types most out of adjustment to the climate. Blonds in light countries are great sufferers from this as well as other abnormalities.

Malnutrition. The far-reaching and permanent effects of malnutrition during development must be particularly studied, for we have been in error in supposing that a temporary check to development and growth is always repaired later. During typhoid fever or any long sickness, the hair is improperly nourished, so that when the growth starts again there is a weak spot in the hair which breaks off at that point, constituting the well-known phenomenon of falling of the hair. Similarly the finger nails are starved and in this part of the nail is a transverse groove which can be recognized until it grows out to the end and is cut off. Other growing cells exhibit a similar phenomenon. Only a few years ago it was found that if a young child is seriously checked in growth by a long period of semi-starvation from disease or improper feeding, it never regains the condition its heredity would have given it. Mentally such children may be below par all their lives. These cases have rather inclined us to the view that undernutrition is the cause of the feeble mindedness which is the real basis for most prostitution and criminality. If the child is in a good environment, it may be taught to be good just as we can teach a horse or dog to behave in a certain way, but if it falls into bad associations which do not necessarily injure a moral man, it is most sure to drift into crime and prostitution.

An investigation of a few cases in which only four teeth in a child were carious and the other sixteen perfect, revealed the fact that a sickness such as a serious enteritis had long prostrated each one about the time the crowns of the four teeth were growing in the gums. I am convinced that some such explanation can be found for the frequency with which the first permanent molars are of defective material or even carious on eruption.

The period at which these crowns grow is one in which the child goes through repeated prostrations of the various infections, such as mumps, measles and whooping cough, all of which are now known to be exceedingly serious in their effects upon the organism, interfering with its nutrition as well as poisoning it. Prenatal syphilis affects only the crowns as a rule and the first erupted. Surely the atrociously decayed teeth of the children of the slums are largely due to bad feeding, for the crowns which develop in the gums during lactation are far better than those which develop afterwards. We must remember that a large percentage of slum children are anæmic, small and chronically hungry. Dental cleanliness unquestionably prevents much of this decay, but it does not repair bad material. Savages are well fed as a rule and their teeth are usually normal and not subject to decay in spite of lack of cleanliness.

Recent work at the Wisconsin Experimental Station shows that the size of mammals at birth is a matter of heredity, and is not altered by maternal feeding, though, of course, malnutrition or infections of the mother greatly affect it. That is, the new born of a species are remarkably alike as their respective environments have been the same. Changes in tooth development come later with bad environments.

I see by the program that the internal secretions are receiving long deserved attention since they have been proved to be the cause of much other deformity, if in excess or deficiency. It is interesting to note that an English writer has collected data showing that hypo-thyroidism is an after effect of intestinal intoxication which in turn has been traced to an origin in pus foci at the orifices of the body, chiefly the teeth, and thus we have a closed chain, as in many another syndrome, having no relation to heredity. Scarlet fever has also been blamed for hypo-thyroidism resulting in cretanism and its disturbed dentition.

Another factor, whose effect is still unknown, is the intermittency of growth. This was discovered many years ago in the Russian military schools, and it was also found that during the periods of growth the child was so lazy and stupid that the usual tasks and studies had to be partly abandoned. It made better progress in the end if it ran wild a few months, for pushing at a time when rest was imperative only retarded it.* It is therefore quite likely that during those periods when the bones and connective tissues are taking all the nourishment, the teeth as well as the brain cells are suffering privation. I have been told that the rapid growth of the jaws and body after certain orthodontic work may be due to these periods and have no relation to the surgery. Unquestionably better mastication after regulation will improve general nutrition as in the case of any other dental work, but we must be on guard to avoid mistaking "post hoc" for "propter hoc." Marvellous moral improvement oc-

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curs in young criminals when their nutrition is improved by any means, but it is wrong to state that bad mastication or the absorption of pus from defective teeth is the sole cause or even the principal cause of their waywardness, as recently asserted. The same plea was made by ophthalmologists a few years back, but eye defects are now known to be only contributory causes which are more or less harmless in the stable and well fed.

We can now revise our opinions of the cause of lack of harmony between the size of the teeth and size of the jaws. Jackson voices the old theory of inheritance of jaws from one parent or race and teeth from another, while Angle says that there is no substantial basis for this idea of heredity. I do not know of any statistical studies of the number of cases of disharmony which have been correlated with the existence of a small jaw in one parent and large teeth in the other. I doubt whether even under Mendel's laws of the segregation of character, such disharmony is possible. Whether a character is dominant or recessive, there is generally, if not always, harmonious development in all hybrids. In a mule, for instance, we never see the appearance of the small jaw of one parent and big teeth of the other or vice versa. The big ears of the ass are dominant, but their relation to the big head is harmonious.

In time we will always be able to find the cause of every departure from the normal—generally it is post natal, often in the parent, sometimes in the grand parent, and very rarely earlier. We will find that abnormalities themselves are not transmissible, but that the germ plasm being continuous will repeat what has been done in prior generations unless the environment changes it. We must cease to refer abnormalities to a mystical heredity and unpreventable results of the will of God, but consider them as material results of material causes which are largely avoidable. The subject is really one for preventive medicine.

Discussion of Dr. Woodruff's Paper.

Dr. James B. Morrison.

It has indeed been a privilege and pleasure for me to have had this paper in my possession for the last two weeks. It has long been a vexed question as to the part which heredity and environment play in malocclusion, and it is most opportune that this society should have presented such a wonderful assembling and sifting of the most advanced thoughts on the subject. I can sympathize with those present who hear this paper read for the first time, as it is something to sit up nights over and study, and I have read it with increasing interest many, many times. Although not presuming to discuss it fully, there are some points I would like Colonel Woodruff to make clear to me. There are many of us who through close application to practice draw our conclusions from clinical evidence, and as one of these I am a believer in the direct inheritance not only of subnormal development, but of peculiar characteristic malocclusions. However, this theory has been set up and knocked down and set up and buffeted about to such an extent that I am exceedingly anxious to get support for it. I have naturally read this paper, looking for this support, and although there are conclusions which point to it, I find that the working of heredity and environment are so intricately associated that it is very hard to say where one ends and the other begins, or whether they do not work harmoniously together in the multitude of changes, good and bad, which have brought about the present condition of the human species. I understand from the paper that the germ plasm is affected in intra-uterine life by the environment, and that the changes effected will or can be transmitted to the progeny; but that mutilations of the body of the parent are not transmissible. And I quote this extract from the paper: "The great advantage of Wiesmanism is the way it settled the baseless idea that a modification of the body so influenced the germ cell in the ovaries and testicles that they would develop into a body possessing the same anomaly."

Clinical Evidence of Transmitted Anomalies.

Now this is a point upon which we as orthodontists have conflicting evidence. I feel sure that all of us here can recall cases where there had developed malocclusion, which bore a marked resemblance to conditions which existed in the parent, and although these are attributed to like conditions affecting development, I have seen them too often and of too striking a character to consider them anything else but the transmitted result of tissue change in one or both parents.

It is rather harder to believe that mutilations of the parent can affect the child; but clinical evidence is again very conflicting, and although I do not find or think that mutilation of the adult will affect the offspring, mutilation such as the removal of teeth of the child during the early developing period of the jaws will affect their offspring. The exact transmitted effect of early removal of first permanent molars is rather hard to trace and isolate, being associated with under-development, which it naturally causes; but the removal of anterior teeth presents a more characteristic and localized effect. I have here the casts of teeth of two children whose mother had the left upper permanent lateral extracted in childhood. I have also casts of the children's teeth, and I am sure we all have, where a canine of the parent had been removed in childhood, and there is a peculiar characteristic lack of development of the alveolar tissue in the canine region, making a pronounced malocclusion inevitable.

These conditions of development, to my mind, are more than coincidences, and point to the vital importance of recognizing the effect on posterity of conditions which exist and influences which affect the development of the child, whether it be light, heat, malnutrition, disuse of organs, or mechanical interferences in the development of the alveolar tissue by the removal of teeth. Dr. Woodruff has aptly said that the subject belongs to preventive medicine.

I do not know how the majority of this society feel in regard to heredity in relation to orthodontia, but can we not give as the principal cause of malocclusion the accumulated result through generations of lack of use of the teeth, and the mutilations previously referred to? If this is the case, is there not a tremendous field for preventive orthodontia, and is it not time to make united efforts? I am obsessed by a feeling that scientific research is often at variance with clinical evidence; but I hope this is nothing more than an obsession. We know that many observations in medicine and dentistry have been disproven by scientific investigation, but even the ultra-scientific disagree, and after all, the one must corroborate the other. This is why I feel that it has been such a splendid thing to have this paper. We must get together on this subject. The laboratory investigator and the clinical observer must help one another.

Dr. Martin Dewey, Kansas City.

I agree with everything Colonel Woodruff has said and openly disagree with the gentleman (Dr. Morrison) who opened the discussion. There is no questioning the fact that we find malocclusion of the teeth in children sometimes, where there has been malocclusion in the parent, and if we go back and investigate the surroundings, we will find these conditions have always been the result of some environment. It is a fact, that under certain conditions, as in the case of bacteria and plants, the character of the germ plasm may change, and you will develop a new species, almost. You can often do it in a very gradual manner. Our attention has been called to the fact that blonde races, by conditions of environment, may be changed to brunettes, because they are more able to exist in some localities. You can take certain plants under one environment and by changing the conditions produce entirely different plants. For instance, in California, Burbank has shown that certain plants that grow near the sea-coast are influenced by the wind and grow large cilia, but farther away from the coast that development of cilia does not occur. A plant under unfavorable environment will develop these cilia and they are transmitted in that locality. Change the locality and that disappears. This shows the close influence of environment upon the germ plasm in that particular locality. As the result of transmission of certain characteristics, we have had before the society the question of the bull-dog, which one of my friends always brings up. Certain characteristics of this animal are produced by inbreeding and selection. We also note the disappearance of certain characteristics when you cross a bull-dog with any other breed, showing that the character which is of no particular advantage is the first to disappear.

I was also glad to hear what Colonel Woodruff had to say in regard to the effects of inheritance on degeneration, the effects of environment upon criminals, because I have had occasion to discuss that question many times. Criminals reproduce themselves because they live in a favorable environment to raise criminals. We must consider the question of variation which is always occurring. If you take a dozen people you will find a certain number of them of average height. A certain number are short, and a certain number long or tall, but if you make an average you get the same height. If you intermarry these short people with tall people, or tall people with short people, they will produce various kinds of progeny. If a tall man be at a disadvantage in that particular locality, the tall man would necessarily disappear. Malocclusions are a decided disadvantage. The reason a deformed limb cannot be transmitted to the offspring is because the normal is always produced.

As regards malocclusion, I have called your attention to the fact before that the deciduous teeth are nearly always in normal position. You have normal occlusion. If you do have malocclusion of the deciduous teeth, it can be traced to some result of environment; that is, in the child the deciduous teeth develop early in intra-uterine life and to a great extent develop in a normal condition, but from the time the permanent teeth begin to erupt, or from the birth of the child the permanent dentition of the child is the result of environment, as improper feeding, improper development, improper living, improper breathing, all of which tend to produce malocclusion.

There is no evidence to support the theory that malocclusion is ever inherited. There is no evidence to support the notion that the large teeth of one parent and a small jaw of the other can occur in the offspring. If they do occur, you will find just as many large teeth as small jaws. You will find just as many large jaws with small teeth as there are large teeth in small jaws. If it works one way, it will have to work the other.

Dr. R. Ottolengui,
New York.

I am naturally much pleased with Dr. Woodruff's paper because it lends so much support to my own view, which is that mutilations and malformations are not inherited.

We are handicapped in our studies of inheritance as related to man, because the individual lives so long. It is much simpler to study the transmissions of characters in the lower animals and plants, because the complete cyle of a generation is so much shorter. It is interesting, therefore, to study and consider these phenomena, as possibly correlated with seemingly similar occurrences in the lives of human beings; yet we should not too quickly accept as proven, that what occurs in vegetable life or with the lower animals, would likewise hold true with human beings.

However, as heredity has been discussed from the standpoint of facts related with bacterial and plant life, perhaps you will pardon my speaking of the lower animals and insect life.

Dr. Woodruff spoke of blondes, blue-eyed races, and deaf-mutism. There are some peculiar and interesting facts in relation to these points to be found in the histories of the domestic feline.

Congenital Deafness.

It is practically an unknown occurrence for a cat to be born deaf, except blue-eyed, white cats, and with these, congenital deafness is so common that when the contrary occurs the dealer advertises: "Blue-eyed, white cat for sale; sound hearing." Yet the yellow-eyed, white cat has sound hearing. If a yellow-eyed white cat be mated with a blue-eyed, white cat, those in the litter having blue eyes will be deaf, while those with yellow eyes will have sound hearing. Here is another very odd fact. If blue-eyed, white cats be mated together the blue color fades more and more with each breeding, but if a yellow-eyed mate be introduced the progeny having blue eyes will have the blue of a deeper color. Thus breeders when trying to produce white cats with beautiful blue eyes are compelled to utilize a yellow-eyed stud, even though this results in some yellow-eyed kittens which are of little value. Now observe that in this mating we have two blue eyes in one animal and two yellow eyes in another. But the finest blue-eyed, white cats in this country have been produced from a pair, each of which has one blue and one yellow eye, known as odd-eyed cats, for which reason they are barred from the cat shows. Yet their kittens have won dozens of prizes.

Sports.

You all have heard of the tortoise-shell cat, but it may be new to some of you that the tortoise-shell is really a "sport," and is always a female. Thus the production of a tortoise-shell cat in the highest perfection is most difficult, since there are no males. The tortoise-shell then is either produced by mating a blue cat with an orange tabby, the litter perhaps containing one or more blue tortoise-shell kittens; or what is preferred, mating a fine black with an orange tabby, which produces the most brilliant coloring. In England there is the history of a great prize winning tortoise-shell, that was mated with various sires with the following remarkable results. Mated with a black, the entire litter was black. Mated with a blue the entire litter was blue. And mated with an orange the entire litter was orange. What would have occurred had she been mated with a white, a brown or a silver I do not know, but it was not deemed wise to carry the experiment beyond the three colors naturally connected with the tortoise-shell. The interesting fact was that the mother, herself a "sport," did not reproduce a "sport" like herself in three litters. This I think is a fairly good argument against the transmission of anomalies, and in favor of the adhesion to type. Be it remembered, too, that the cat is a mammal.

Effect of Diet.

We have the exact analogy to this in insect life. You all are familiar with the large black and yellow, swallow-tailed butterfly, common along the entire Atlantic coast. Its name is *papilio turnus*. There is a variety called *glaucus,* which is analogous with what I have told you of the tortoise-shell cat. The male of *turnus* is always black and yellow, really yellow with black stripes. In New England the female is orange and black, and is known as the typical *turnus* female. In the Carolinas and southward, however, the female is black, and is called, variety *glaucus*. To test the question as to whether these were two different species with similar males, or a single species with two forms of female, Prof. Smyth, with the aid of a New York correspondent, made experiments. He collected eggs from *glaucus,* the black female, and sent them North to be reared. They were fed on the plant which the caterpillar eats in that locality, and out of a hundred specimens, every female was the true orange or typical *turnus* form. Some of these were mated with native *turnus* males, the eggs divided and half returned to Smyth. All the eggs reared in New York produced typical females, while all those reared by Smyth produced *glaucus* females. Both men again mated females and divided the eggs. The question now was to determine whether it was climate or food which produced the *glaucus* form. Therefore the eggs in each locality were fed half on the northern food plant, and half on the southern, and in each instance all that were fed on the plant common in the South produced the black or *glaucus* females, and those fed on the northern food plant produced typical orange and black females. This, I think, definitely proved that the *glaucus* or black "sport" was for some odd reason due to the food plant. Why the *glaucus* form is never a male, and why the males should not be affected by the food plant, are seemingly an unsolved and perhaps an unsolvable problem. But these facts show at least how difficult it is to actually pierce the mystery of heritage. When the females are so totally different, dependent upon the food, it is strange that the diet should have no effect upon the males.

Effect of Cold.

Though I fear that I am speaking too long, may I touch on the question of environment? There is another common butterfly, *vanessa antiopa.* The wings are of a mahogany brown with an orange and a blue strip at the extreme outer borders. A man in New Jersey collected several hundred of the pupæ of this butterfly, and placed them in a refrigerator. At definite intervals he would remove a stated number from the refrigerator, keeping them thereafter at room temperature. When all the imagos had emerged, it was found that the blue and the orange had faded away or disappeared entirely, just in proportion to the time that the pupæ had been exposed to the icy temperature.

Effects of Locality.

There is a very beautiful sphinx, *triptogon modesta,* fairly common in New England, which is dark, mouse-colored gray. A similar creature, though rather larger, was taken in California, and is a pale, creamy color. The collector named it *triptogon occidentalis.* In my own collection I have a series taken from New York to California in various States between the two coasts, and as we go West we find the dark gray color gradually changing to the light cream, apparently showing that the color depends upon climate, or food, or both; at all events upon environment.

Hybrids.

Hybrids have also been produced in insect life. *Attacus cecropia,* the largest of our American moths, sometimes called the American silk worm moth, will mate with any of its congeners, *attacus columbus* in Canada, or *attacus gloveri* or *ceanothi* from the West. Oddly enough I have never seen a hybrid of any two of the other three, but I have hybrids of *cecropia* with all the others. In every case it is perfectly easy to determine which species was mated with *cecropia* to produce the hybrid, the progeny being a symmetrical suffusion of the markings and coloration of both parents.

Experiment on Pupae.

As bearing upon what Dr. Woodruff said of accidents during intrauterine life, let me relate a remarkable experiment with this same moth, *cecropia,* which was made by a Columbia professor whose name, I regret to say, escapes me. He took numerous pupæ of *cecropia,* and froze them hard enough so that they could be divided with a razor without allowing their fluid interior to move. Some he divided horizontally, and others vertically. He then applied the one-half of a male pupa to the similar half of a female pupa. These divided pupæ reunited, and developed to the imago stage, the progeny being half male and half female in form, a result which I think was as astounding as any experiment ever reported in so-called plastic surgery. The males and females of this moth are easily distinguishable, both by their pattern and coloration, and also by the fact that the antennæ of the male is very much larger and coarser than that of the female. Thus the pupæ, which had been divided vertically produced moths with a male antenna and wings on the right, and a female antenna and wings on the left side. Where the incision had been horizontal, the upper wings were those of one sex and the lower wings and body those appropriate to the other. Thus we may say that hermaphrodism was here produced surgically, the operation having been performed on the pupæ, which is between the larval and the imago stages.

In passing this it is worthy of note that whereas many of the large collections (notably that made by Strecker) show specimens of hermaphrodism, specimens of hybrids are almost never found in nature; indeed I do not know of an instance that could be called authentic, excepting the single instance of a European female sphinx, which was tied to a tree during the night, by a Brooklyn collector, and was found mated with a congeneric American spinx, the resultant eggs producing an imago, the underside of which resembles the American, while the upper sides of the wings more closely simulate the European. Yet even here, at least one of the individuals was in captivity. The point I wish to make is that all hybridization of this sort known to me have been produced by man's intervention and not by untramelled natural selection.

What is Type?

We talk glibly of type, and of the persistency of type. How are we to determine just what is typical in man? What race or tribe is there in the whole human family that is not an admixture, with the possible exception of the Laplanders and the Fuegans? What is type? In entomolgy, when a man names a new species, he pins a label upon the specimen used for the description, and labels it "Type." This, of course, is an arbitrary rule. Harry Edwards, the great actor and equally great entomologist, once named a moth from Colorado. He had hundreds of specimens before him, varying from almost solid brown with a few cream-colored splotches, to almost all cream with a few brown markings. He made a series of ten pairs, all different as to individuals, but grading from one extreme to the other, and he labeled the entire set, "Type." Was he not right, and is it not much the same with humans?

Transmission of Malocclusion.

Dr. Morrison builds an argument on a single instance where two children had a lack of space in the same region as the mother. What will he say of the following case? I had a child with the lower left bicuspid in contact with the lower lateral. The mother had the temporary cuspid retained in the same locality. I radiographed the mother, and the missing cuspid was congenitally absent, but when I radiographed the daughter the missing cuspid was present. Note that the congenital absence of the cuspid was not transmitted.

In another of my families there are twelve children. With identical ancestors, should we not find some similarity in the malocclusions, if malocclusion can be transmitted? Both parents have slight aberrations from the normal, no more. The first born, a girl, had a practically normal occlusion. In those of the others who have developed permanent teeth there are various degrees of malocclusion, including two cases of Class II, Division 1, and one of Class II, Division 2. None of the malocclusions resemble each other or the parents in any marked degree.

But, of course, isolated cases prove nothing; neither where the malocclusion are similar or dissimilar. The last case is of interest only because there were so many children.

The Jukes Family.

All who disbelieve in the influences of environment should read the history of the Jukes family, to which Colonel Woodruff has alluded. This family was practically segregated for several generations, and there was every grade of degeneracy, including criminality in the males, prostitution among the females, and alcoholism and pauperism among both. Yet this great truth was discovered, that whenever a Jukes man escaped from his environment, went and lived at a distance from and away from communication with his own people he ascended the social scale. Likewise when a Jukes woman married a normal outsider and changed to the environment of her husband she lived a more normal life. In conclusion the optimist must continue to hope that mutilation, deformities and degeneracy of all kinds, are not transmissible; that there is always a tendency towards the highest type. Otherwise the future of the human race would be hopeless indeed.

Dr. F. C. Kemple, New York City.

I would like to ask Colonel Woodruff a question in regard to deaf-mutism. As I understood him, he made the statement that deaf-mutism is persistent; that it is a permanent and transmissible characteristic. It just happens that I know of a few deaf-mutes whose parents were apparently perfectly normal. They had three children, and two of them were congenitally deaf. I know of other mutes where the father and mother are both mutes, and their children are apparently perfectly normal children, bright and active. I just wonder what percentage of exceptions there might be to the rule.

Colonel Woodruff (closing). The cause of arrest of development of the jaw is a very great puzzle to me. I have been studying it for twenty years, but I find one generalization. In Japan I found that those who live in cities are very prone to arrest of development of the jaw and malocclusion in very bad form. In China I found the same thing. The great, splendid specimens of Japanese wrestlers and acrobats, are all countrymen so far as I know.

I was very much struck in London two or three years later to find an enormous number of these deformities among the city people, and so far as I could see they were much fewer on the farms. I have found a great many in this country, too, and there is something injurious in the abnormal environment of city life which is not what we are accustomed to by Nature. A cause may be the bad nutrition of the city people as compared with those of the country. The well-to-do in the city live very much better than those in the country. Nevertheless, in New York State, the death rate in the country districts is greater than in the cities. They have many deformities, too. Their tonsils are enlarged, they have adenoids and bad teeth. Children are overclothed in the summer and underclothed in the winter. They are overheated in the homes and sent out perspiring. I have an idea that the bad methods of living have something to do with the remarkable fact of deformities of the lower jaw being so common. Whether it is hereditary or not, I think, depends upon the definition we make, and also whether it is a temporary or spurious heredity which lasts a certain number of generations.

Some remark was made about blondes changing to brunettes. That never occurs. Blondes disappear by higher mortality. You have never yet seen a blonde race change into a brunette one except by the very long, drawn-out process of survival of the fittest.

In regard to white cats, they are more or less albino, and are somewhat degenerate. The albinos, I mentioned, have poor resistance. The sight of the albino is very poor. They are affected by too much light are short-lived, and they transmit this defect in accordance with Mendel's law.

If we look into the question of transmission of characters by mating between different kinds of cats, we will find they follow Mendel's law. I cannot say definitely about the cats which Dr. Ottolengui mentioned, but I think they follow Mendel's law.

As to butterflies showing the effect of environment, it has been proven that certain insects change from one climate to another. If the environment changes and they happen to be better fitted for that climate they survive. There is a certain butterfly which is dark in cities and light in the country, and it has been increasing in numbers as cities have increased in size and number in Europe, and this has something to do with the increasing brunetteness of cities. Blondes disappear from cities unless they live in the suburbs. If you take any city and go from the congested districts outward, you will find an increasing proportion of blondes, because they have instinctively known how to take care of themselves.

With regard to deaf-mutes appearing in normal families, that is a case of a recessive character reappearing. Characters may be recessive for several generations, and then appear upon mating of the proper kind. Deaf-mutism, polydactylism, albinism, and everything of that sort will appear sometimes after several generations.

A Consideration of the Question of Early Treatment of Malocclusion.

By Frederick C. Kemple, New York.

During the past ten years the question of the proper time to begin the treatment of malocclusion has received attention and discussion mainly, if not entirely, from but one viewpoint, *i. e.,* that favorable to so-called "early treatment." During this decade the orthodontist has both preached and practiced "early treatment"; appliances have been placed on the teeth and the operation for correcting malocclusion begun at what he considered the "first manifestation of malposition" of the teeth.

Prior to this decade, during which the propaganda for early treatment has become so strong there was a period in which parents were instructed to wait until the child had all of the permanent teeth (except third molars) fully erupted. Some text-books gave the interval between the ages of twelve and eighteen years as the most favorable time for treating these deformities. During the present crusade for early treatment, cases are recorded in which this work was started for babies as young as two and a half years of age. Thus, within the short span of a few years, orthodontia, on the question of "proper time for treatment," has gone from one extreme to the opposite; from the adult, as the proper time to begin treatment, almost to the infant in arms.

In the opinion of the writer, this propaganda for early treatment, in the large majority of cases, is just as extreme and just as radically wrong as the previous theory for delay was erroneous and injurious. In the present paper it is my purpose to consider the question of "proper time for beginning treatment" from a standpoint intermediate between these two extremes. I do not wish to place myself on record as being opposed to all early treatment—I have some patients as young as four and five years of age—but I do wish to express an emphatic and absolute opposition to *unnecessary treatment,* and also to *unnecessarily prolonged treatment* for young patients, and by "young patients" I mean children under eight or nine years of age.

There can be no fixed rule for the time to begin treatment made which will be a safe guide to follow in all, or even in the majority of cases. Conservative judgment, born of careful observation and experience, must always be the safest foundation upon which to base our decisions.

Arguments in Favor of Early Treatment.

The reasons for delay which were given a few years ago have been so completely exploded that it is unnecessary to even touch upon them in this discussion. Also the arguments adduced in support of the early treatment propaganda are quite familiar to all of us and need only be mentioned, viz., "the ease with which teeth are moved in early life," "growth and repair most rapid at this time," "stimulating development," "aiding Nature," "guiding erupting teeth," "inducing bone growth," "increasing the width of the nasal spaces," "insuring greater regularity in size and position of the antra and of all the other sinuses of the face," etc., etc. It has even been stated in a recently published paper that the size and shape of the sella turcica, the seat of the pituitary body, may be changed by widening the upper dental arch.

Many of these arguments are of insignificant importance. For example: We can move teeth almost as easily at ten years of age as we can at six—there is not enough difference in the amount of pressure required at the two ages to be worth a moment's consideration; and the rate of growth and repair at ten years of age may be as rapid as at any earlier age so far as we are able to judge—at least the rate of growth and repair at ten is sufficiently rapid for orthodontic purposes. Also in our zeal to "aid Nature" we may rush to her assistance in many of these cases at a time when she would be much better off without our ministrations.

There are some of these arguments, however, if supported by acceptable clinical evidence, that would be very good and sufficient reasons for beginning our treatment at almost any early age; the earlier, probably, the better. But, unfortunately, the more important in this catalogue of reasons are but bare assertions; they are statements of what we would *like* to believe *might* take place, but they are not supported by adequate clinical facts. They are purely presumptive. For example: We do not know that the bony structures which underlie the alveolar process are stimulated to any greater or better development through orthodontic measures than they would be without it; it has not been shown in any definite manner whatsoever that gentle pressure on the teeth at an early age, or at any age, will cause an increased growth of bone beyond the immediate region of the alveolar process.

Nor have we been able to demonstrate that the width of the nasal spaces can be increased in the slightest degree by even the most extensive widening of the upper dental arch.

Also there is not an atom of demonstrable evidence to indicate that early treatment will in any manner affect the size or position or shape of the antra or of any of the other sinuses of the face. Statements to the contrary are presumptive, and are founded on hypothetical reasoning, and not on observed facts.

If the form or structure of the maxillæ or mandible can be changed by changing the position of the teeth, we might naturally assume that the general shape and contour of these bones, in cases wherein the teeth have not been disturbed by artificial movement, would bear some definite relation to the contour of the dental arches. An examination of a number of skulls, however, will hardly bear out this assumption. Narrow, constricted and crowded dental arches may be frequently found perched upon well-developed mandibles—and frequently the upper anterior teeth are decidedly prominent in relation to the maxillæ proper, which conditions certainly indicate that there is not a definite and fixed relation existing between the two.

It is true that well-formed facial bones usually accompany normal, well-developed dental arches, but this does not signify that the degree of development of these bones is necessarily dependent upon the form of the dental arches. It might rather indicate that the same forces working for normal growth were active in both parts.

Relation of Dental Arch to Nasal Space.

Also, if the width of the nasal spaces is increased in conformity to the degree of expansion produced in the upper dental arch in treating malocclusion, it would be reasonable to expect all normally wide dental arches to be accompanied by relatively wide nasal spaces; and, conversely, narrow upper dental arches to be associated only with narrow nasal spaces. But the direct reverse of this relation is frequently found to exist. I recently examined a few skulls from Dr. M. H. Cryer's collection, and among this small number there were four in which the upper arches and nares measured as follows:

Skull 1. Measured from the mesio-buccal cusp of the second molar across the arch to the mesio-buccal cusp of the opposite second molar 2.13 inches. The nasal space in the same line measured 1:52 inches.

Skull 2. Measured from the mesio-buccal cusp to the second molar across the arch to the mesio-buccal cusp of the opposite second molar, 2.58 inches. The nasal space in the same line measured 1.34 inches.

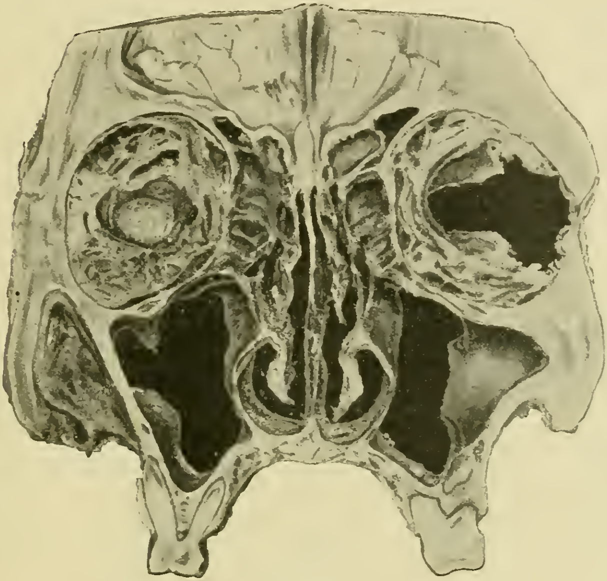

Fig. 1.

Fig. 1 is made from a skull with a very wide arch and a narrow compressed nose. The outside measurement of the arch is 66 mm. The nose should be 35 mm. but is only 20 mm. It will be noticed that the maxillary sinuses are very large, which is usually the case where the nose is so narrow. When the nose is wide the antra are often small, or may even be undeveloped. (Cryer.)

Skull 3. Measured from the mesio-buccal cusp of the first molar across the arch to the mesio-buccal cusp of the opposite first molar, 1.76 inches. The nasal space in the same line measured 1.42 inches.

Skull 4. Measured from the mesio-buccal cusp of the first molar across the arch to the mesio-buccal cusp of the opposite first molar, 2.36 inches. The nasal space in the same line measured 1.31 inches.

In No. 1 and No. 2 the measurement was from the second molar across the arch to the opposite second molar. In this region the arch of No. 2 was .45 in. wider than in No. 1, while the nares of No. 1 was .18 in. wider than in No. 2.

In No. 3 and No. 4 the measurement was from the first molar across the arch. In this region the arch of No. 4 was .60 in. wider than in No. 3, while in No. 3 the nares was .11 in. wider than in No. 4.

These are examples of wide dental arches being accompanied by narrow nasal spaces; and of narrow dental arches accompanied by wide nasal spaces. In speaking with Dr. Cryer about this condition, he expressed the opinion that the width of the nasal spaces probably is governed more by the size of the antra than by the width of the dental arch. In an excellent paper read before this society, in Chicago, in July, 1912, Dr. Cryer called attention to this non-conformity in size of dental arch and nasal space, and showed pictures of several skulls illustrating the lack of definite relation in these two regions. Two of the illustrations used by him at that time are here reproduced in Figs. 1 and 2.

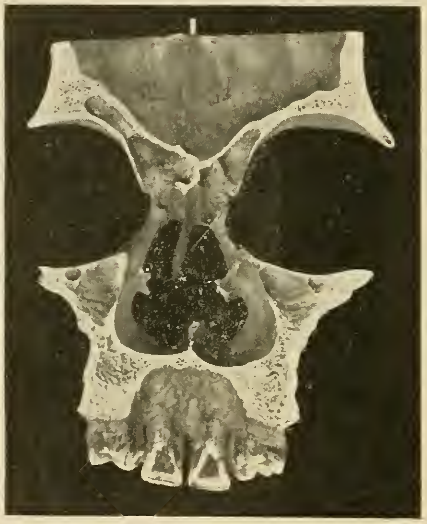

Fig. 2.

Fig. 2 is made from a skull showing one of the narrowest arches in my collection. The width of the arch across the outside of the second premolars is but 44 mm., while the floor of the nose measures 35 mm., one of the widest I have at this point of measurement. (Cryer.)

At the request of Dr. Kemple, the following report of a case from practice is appended. Patient was referred by one of the most prominent rhinologists with the following statement:

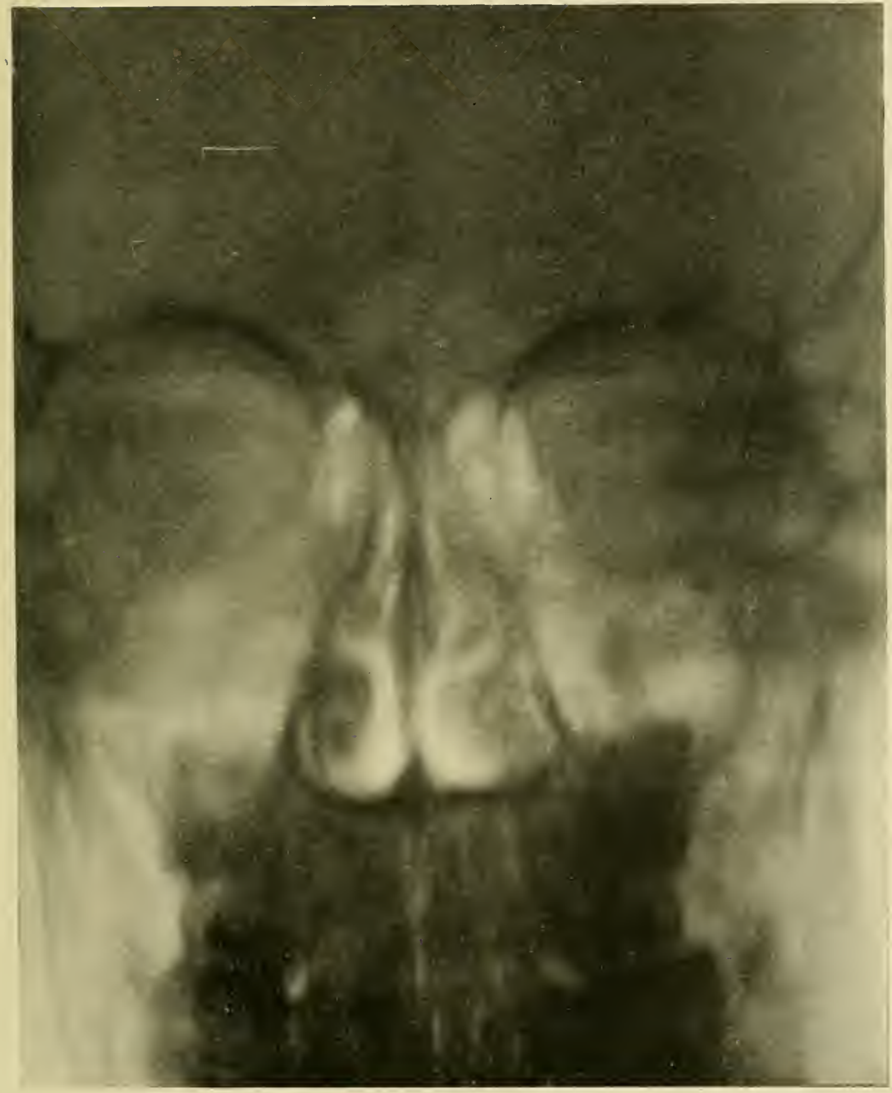

Fig. C. (Radiograph by Schamberg.)

Radiograph showing condition in living patient similar to those shown by Cryer in the skull seen in Fig. 1. Very wide arches with exceedingly narrow nasal space. For proper comparison remember that this radiograph is not reduced while Cryer's figure is about half size.

"This boy has the narrowest nasal spaces that I have seen. Would it be possible to increase his capacity for nasal breathing by widening his dental arches?"

An examination disclosed exceedingly wide, well-formed dental arches, which if anything were over-wide, as spaces existed between several teeth in both arches.

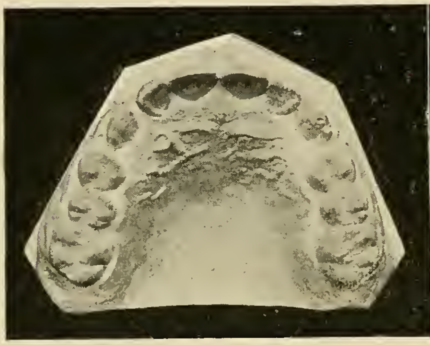

Fig. A.

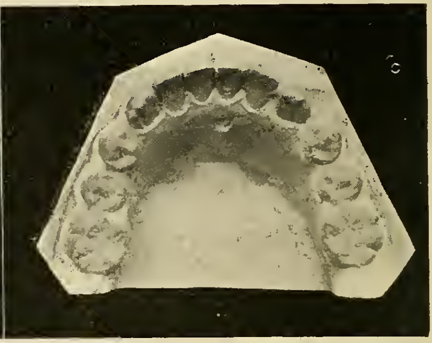

Fig. B.

Figs. a and b show occlusal views of the upper and lower casts.

Fig. c is from a radiograph taken through the skull and shows the comparative width of the nasal spaces and the dental arches. The radiograph is interesting for comparison with Dr. Cryer's sections of skulls, because here we have disclosed a condition as it existed in life.

R. Ottolengui.

Also, in listening to these witching arguments that we should aid Nature at the very earliest opportunity, many of us are likely to lose sight of one of the most important facts in biology, viz., that *Nature is constantly making an unremitting effort to overcome her own defects.* Another important fact that should be kept in mind before embracing the "early treatment" doctrine, as a rule for all cases, is, that we have not yet arrived at that degree of skill in diagnosis of malocclusion where we can always be able to say with nicety just what is normal and what is abnormal in deciduous and mixed dentures. These are important facts, and are worthy of serious and conservative investigation before attempting to sweep them aside by any course of inductive or deducative reasoning.

Possibilities of Development.

In viewing early treatment by this light I am not detracting one jot or tittle from the true value of orthodontia as an important element in the healing art, nor from the value of early treatment when its need is really indicated. The real worth of orthodontia as a factor in the physical and mental development of the child has been amply demonstrated. Its benefits to hundreds of children are evidenced on every hand. But, like every good thing, orthodontia, in my opinion, is being overdone through this inordinate propensity for early treatment. I sincerely believe that a large percentage of the cases that are now being treated at five and six and seven years of age would need no treatment whatever if the beginning of the operation were deferred until the child had reached the ages of nine or ten years. I claim for orthodontia all credit that rightfully belongs to her, but I also wish to give Nature a fair chance to do her work in her own mysterious way.

In the discussion of a paper read before this society a few years ago, Dr. L. S. Lourie, of Chicago, expressed himself as follows:

Dr. Lourie's Views.

"I think we will have to change our mode of observation before we can determine what is the normal width and size of the arch at various ages. . . . . I do not feel that I am justified in expanding deciduous arches to make them the width that the permanent arch is going to be. I frequently notice that the bicuspids and cuspids are developing in the process quite a bit buccally to the position of the deciduous arches, and I do not see the object of disturbing the deciduous arches for the purpose of causing the bicuspids and cuspids to come in buccally, as they will do anyway in a large percentage of cases."

Last year at Chicago Dr. Dewey, in his discussion of Dr. Young's paper, used this language:

Dr. Dewey's Views.

"Because you do not find spaces between the deciduous teeth at six is no proof that they will not be there at six and a half years of age. Individuals develop at different ages. A condition at the age of six may be normal for that individual, and in the next youngster at six and a half a similar condition would be normal for that age."

Dr. Dewey could have extended the time six months at each end, making the range a year and a half instead of six months, and he would still have been well within the realm of fact.

If there happens to be a marked insufficiency of space for the permanent incisors, even when these teeth come through the gum, it is not proof that there will not be sufficient development to accommodate them in proper alignment and position by the time they are fully erupted.

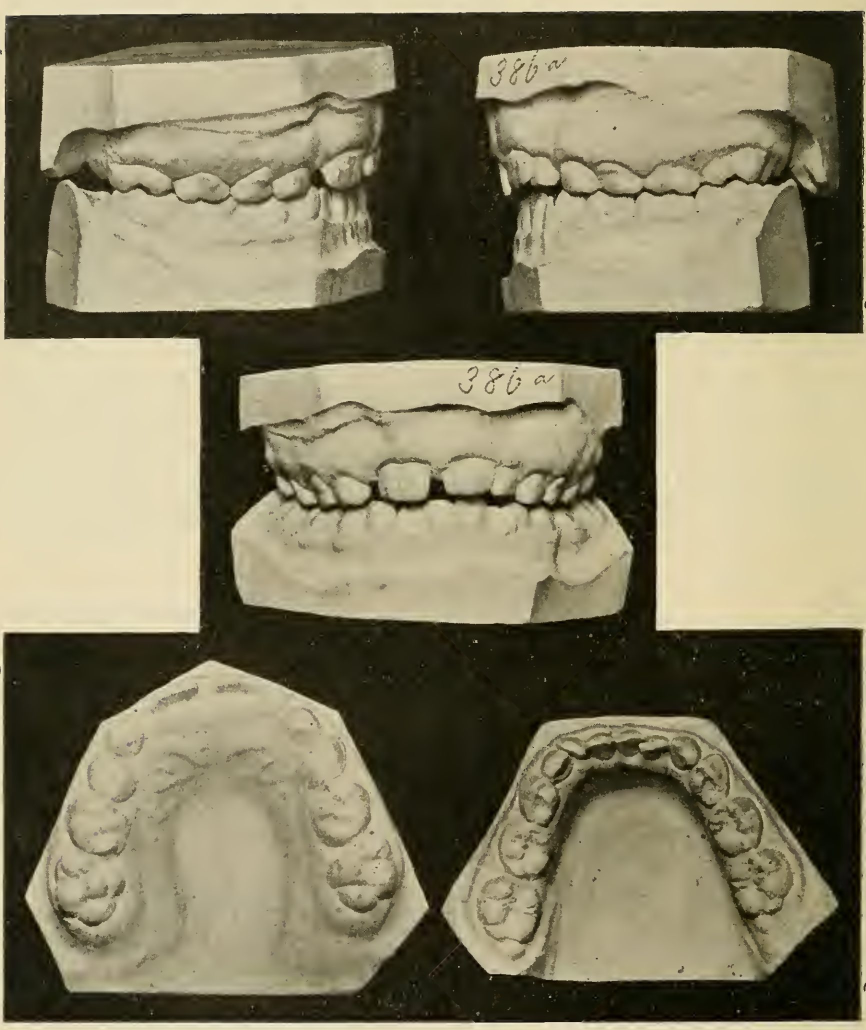

Fig. 3.

Every dentist of experience has observed incisors "straightening themselves." In one of the early editions of Dr. Angle's work he gives this bit of wholesome advice:

Angle's Advice.

"Studiously avoid needless interference in those cases where it is apparent that Nature will, unaided, correct the deformity; but take professional pride in encounters with the interlocked, twisted and over-

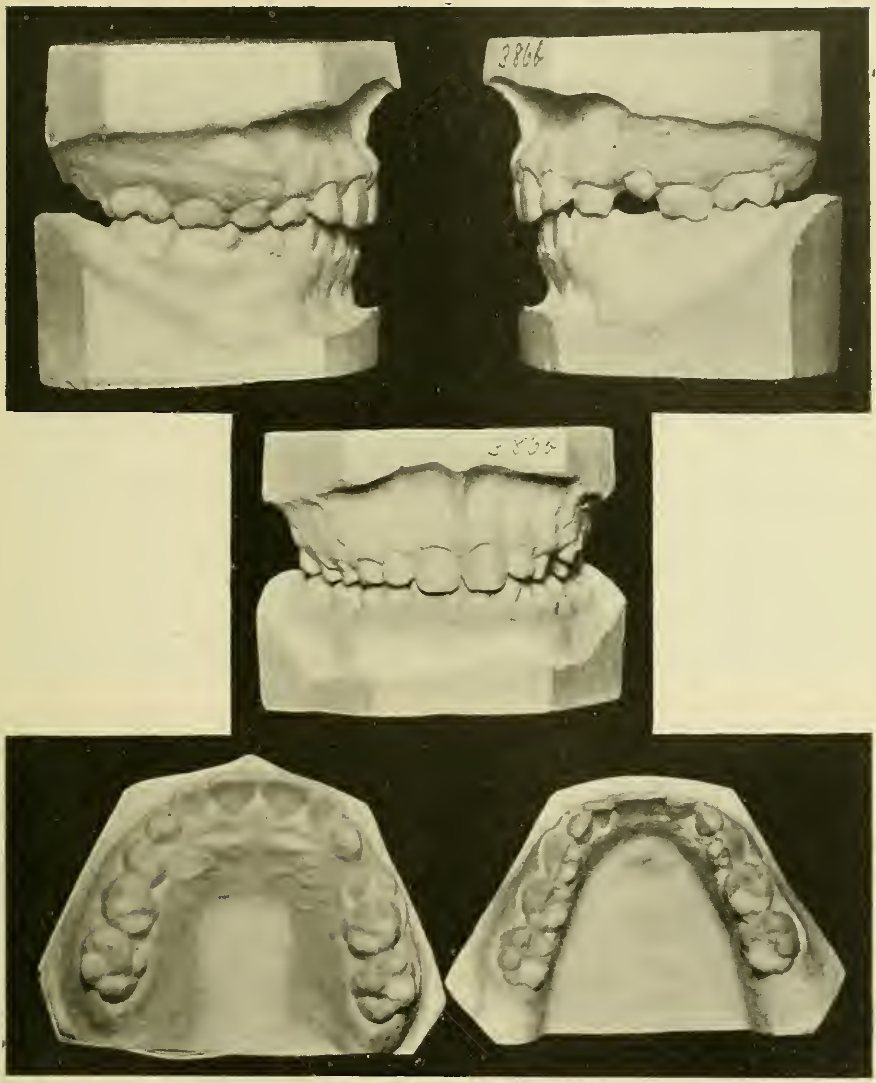

Fig. 4.

lapped, or otherwise malposed teeth, which usually become worse and complicate the condition of the teeth yet to be erupted."

These were golden words, and are worthy of a place over the working cabinet of every orthodontist. But, unfortunately for all students of orthodontia, and particularly for the young orthodontist, these invaluable words of caution and warning have been, either studiously or inadvertantly, omitted from all later editions of this work.

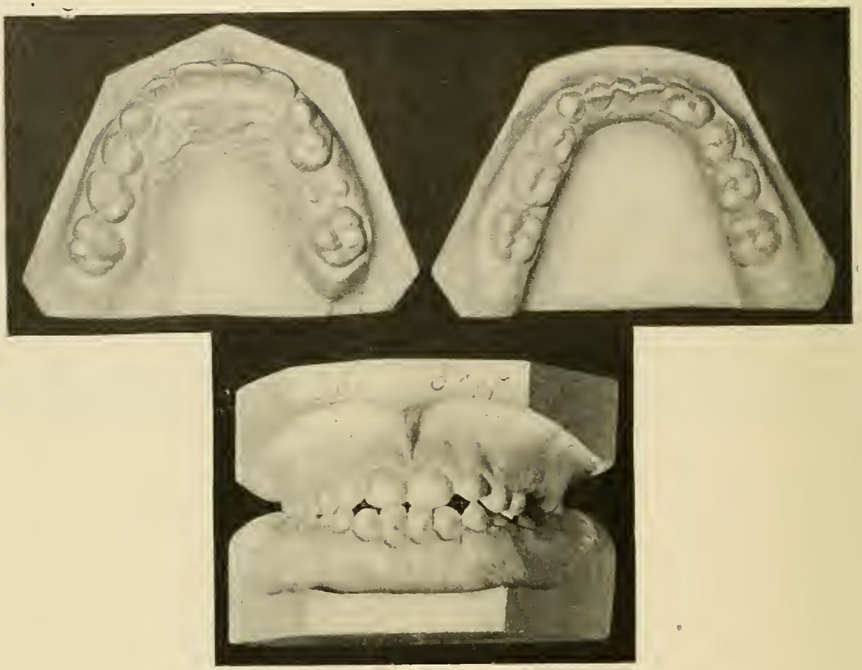

Fig. 5.

Study of Early Malocclusions.

There are many cases in which the malocclusion in very young children is more apparent than real, and in which the natural tongue and lip pressure are often as effective in correcting the doubtful deformity as would be the expansion arch, ligatures, etc. The forces of normal tongue and lip pressure, which are constantly active, will often bring malposed erupting teeth into alignment and proper occlusion. This is particularly true of cases where the lower permanent incisors may be erupting in a lingual position, and where the arch may or may not be slightly narrow. The lower incisors frequently peep through the gum in a position considerably lingual to normal in spite of the fact that there may have been ample room for them to have assumed their proper places in the arch. Other cases which Nature will often succeed in correcting, are those in which the upper incisors are more or less out of alignment while erupting, with the arch slightly constricted, or not, as the case may be.

But suppose Nature of herself is unable to complete the corrective operation in these cases, suppose there is some obstacle interfering with her efforts to such a degree that she must have the assistance of an orthodontist to complete the work. Such slight malocclusion is probably not causing the child the least physical or mental injury, nor even inconvenience; and is it too late at nine or ten, or even eleven years of age, for the orthodontist to finish the work in such cases? In these instances, if he will be patient and wait a few years. Nature may surprise us with her accomplishments in orthodontia; and if she does not, if Nature has not succeeded in correcting the malocclusion, we have not lost anything by waiting. The case can probably be corrected as easily, or more easily, perhaps, at ten years of age than it could have been at five or six or seven.

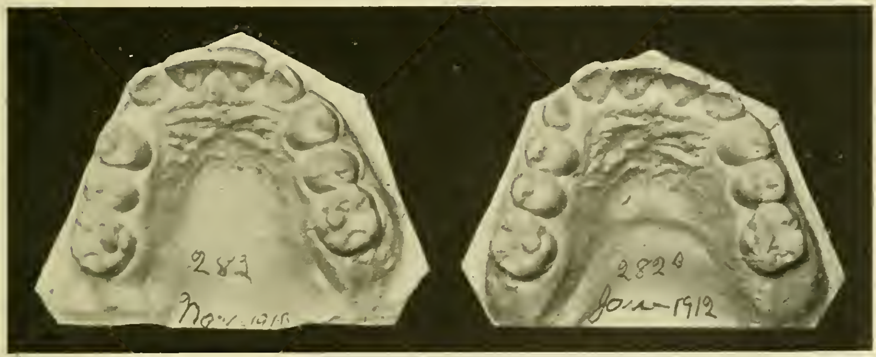

Fig. 6.

An early start, according to the doctrine of "guiding such erupting tooth," usually involves carrying the treatment over the entire period of transition from the deciduous to the completion of the permanent denture, which means that the child must wear appliances on the teeth more or less continuously for five or six or seven years to accomplish what could just as well have been effected at a later age, and with much less effort in two or three years or less.

In those cases in which it seems necessary—or even desirable—at six or seven years of age, or even younger, to relieve an excessive malocclusion which may be interfering with the child's ability to masticate, or to breathe properly, or which may be in any wise affecting the health injuriously, such a case, in my opinion, should be relieved immediately. But relief in these cases does not imply the necessity of restoring ideal occlusion of the deciduous teeth; and it certainly should not indicate the beginning of an operation that must be continuous and uninterrupted over a period of six or seven years. The interference with the child's physical or mental development, which may be caused by the malocclusion, can probably be removed by restoring a fair amount of masticating surface and producing sufficient expansion of the arches to make room

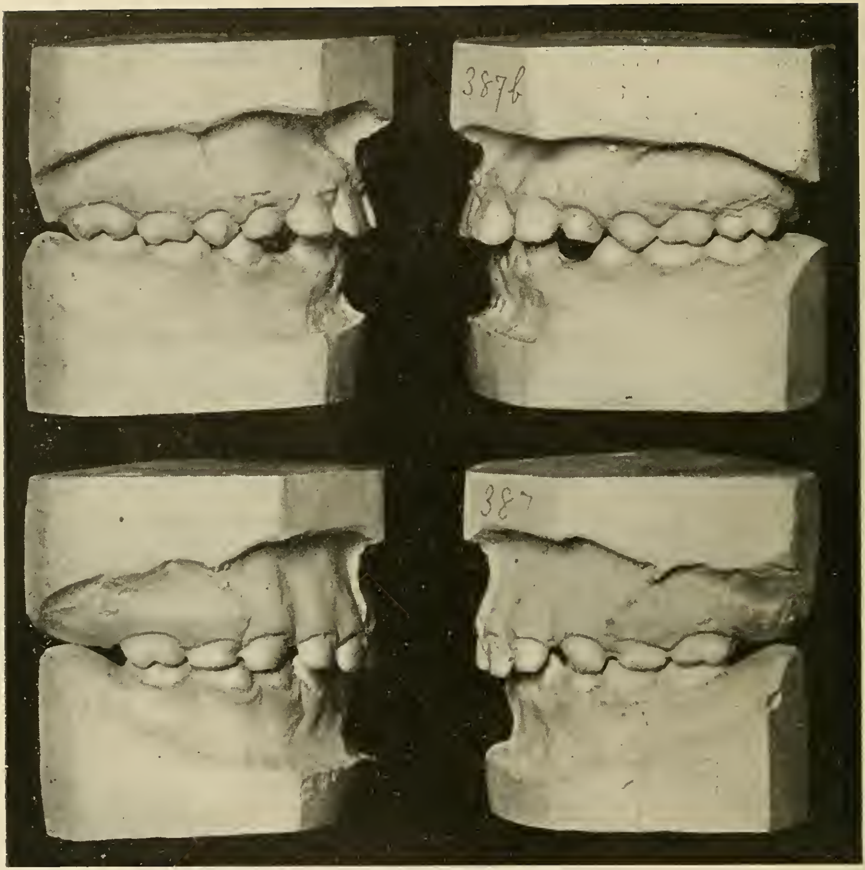

Fig. 7A.

for the tongue to occupy its proper position, and to relieve any constriction of the nutrient vessels or nerve channels that may have resulted from an excessively narrow arch. This effect can usually be accomplished by a few months of treatment, and the case can then be practically dismissed until the child is eight or nine years of age. After such an interval of waiting, during all of which time Nature has been unhampered and uninterfered with in her efforts, the treatment can again be taken up and carried to completion. Treated in this manner the case will, in all probability, be finished just as soon, according to the calendar, as it would have been had the treatment been carried along continuously from the beginning. The interval of "watchful waiting" has not been lost, but can be counted as time saved for the patient, the parent and the

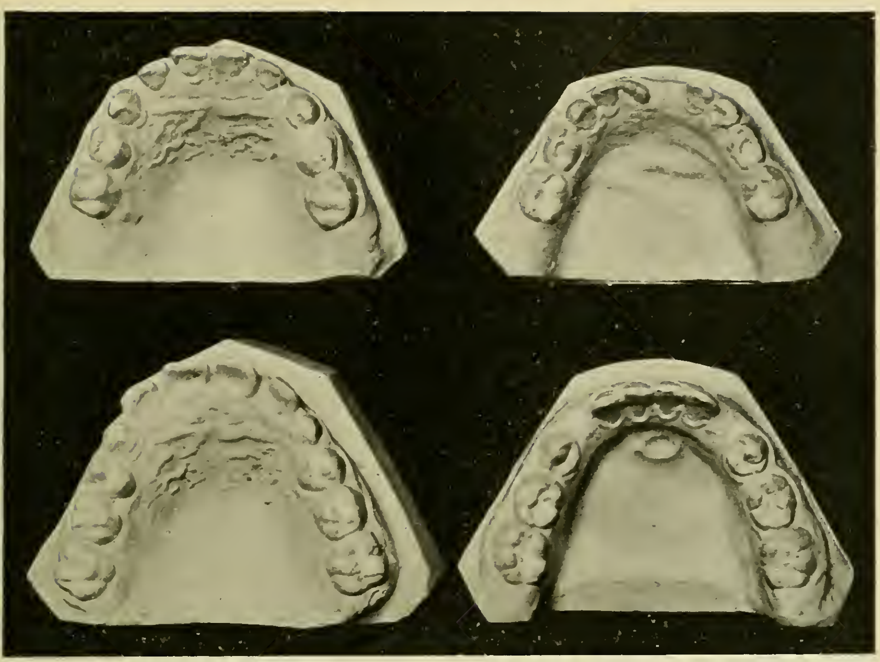

Fig. 7B.

operator. The period of treatment under such circumstances will probably cover two or three years, instead of six or seven.

In my opinion, the percentage of our cases that really require this very early treatment for the relief of retarded physical or mental development is very small in comparison with the whole number who are afflicted with malocclusion. Probably ninety per cent. or more of the patients who present to any of us for treatment will measure up to the average child of their age in height, weight and mental activity, their parentage considered.

Between the ages of six or twelve years children seem to thrive without the benefit of a large area of masticating surface—nature appears to have provided other means to compensate for the period of dental transition, during which time the masticating utility of the dental organs is so much reduced.

I believe each one of you will agree with the following proposition as a basic principle in orthodontia:

Final results being equal, the fewer and simpler the appliances used in the treatment of malocclusion, and the shorter time the appliances remain on the teeth, the better for the patient, the parent and the orthodontist.

This paper may be considered an appeal in behalf of our little patients for the adoption of the principle in our practice.

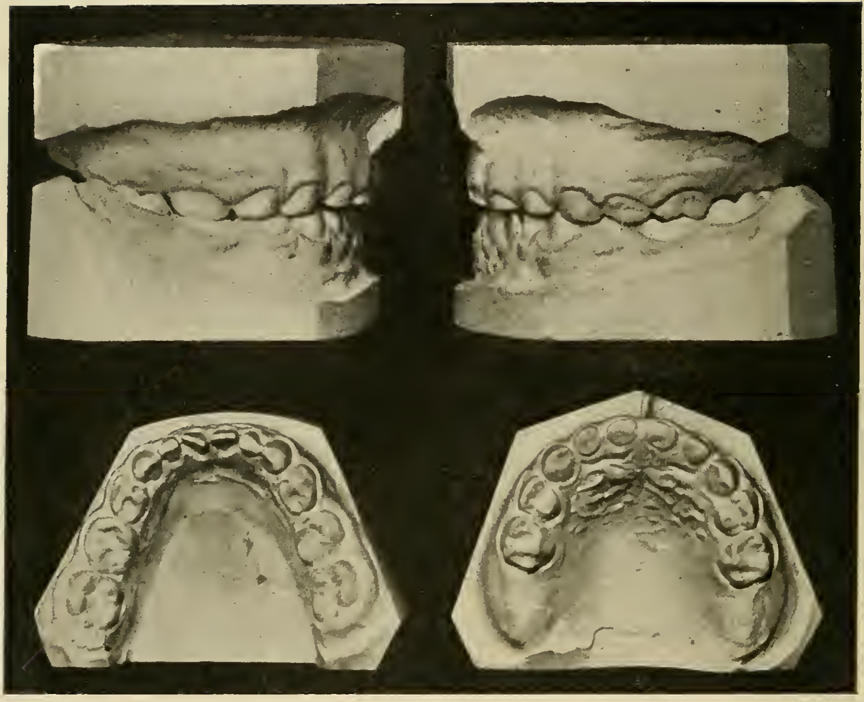

Fig. 8.

Illustrations.

A few illustrations may serve to bring out more clearly the points which I have tried to describe: Description—"Fig. 1 is made from a skull with a very wide arch and a narrow, compressed nose. The outside measurement of the arch is 66 mm. The nose should be 35 mm., but is only 20 mm. It will be noticed that the maxillary sinuses are very large, which is usually the case where the nose is so narrow. When the nose is wide the antra are often small, or even may be undeveloped."—*Cryer.*

"Fig. 2 is made from a skull showing one of the narrowest arches in my collection. The width of the arch across the outside of the second premolar is but 44 mm., while the floor of the nose measures 35 mm., one of the widest I have at this point of measurement."—*Cryer.*

Fig. 3—Shows the front, side and occlusal views of the mouth of a boy, aged seven years and seven months. The upper central is .35 of an inch in width; the arch, both upper and lower, are perceptibly narrow; the upper centrals are abnormally spaced; and the room for the permanent laterals, which have shown no sign of erupting, is constricted to

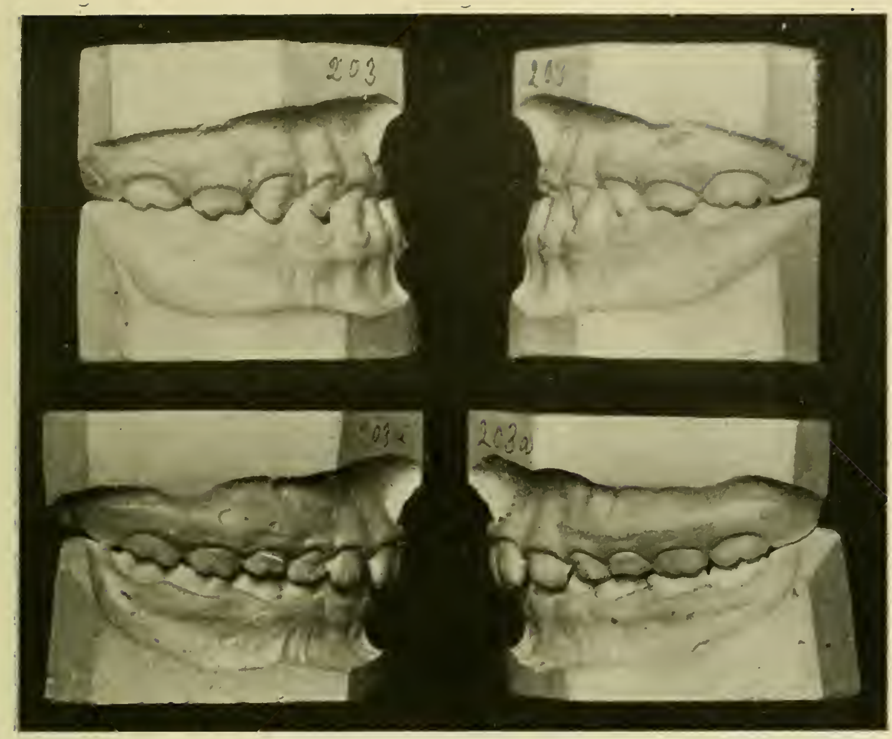

Fig. 9.

about half what it should be. The lower incisors are markedly crowded and out of alignment, and the arch is narrow.

Fig. 4—Shows the front, side and occlusal views of the same mouth two and a half years later, at the age of ten years and one month. The four upper incisors are in practically perfect position and alignment. The laterals, which are .25 of an inch in width, have forced themselves into the constricted spaces which were only .10 and .19 of an inch, respectively; the space between the centrals has closed in a perfectly normal manner; and the four incisors occupy 1.14 inches of space between the canines, which is .20 inch increase during the eruption of the laterals.

This one instance in itself tells a wonderful story of what Nature can accomplish in many of these cases if allowed to do so in her own way. When this boy was seven years of age, circumstances over which the parents had no control, made it practically impossible for them to give the time necessary for the treatment of the case, and much to their regret at the time and the regret of the orthodontist the work had to be indefinitely postponed. But it was postponed with the parents under-

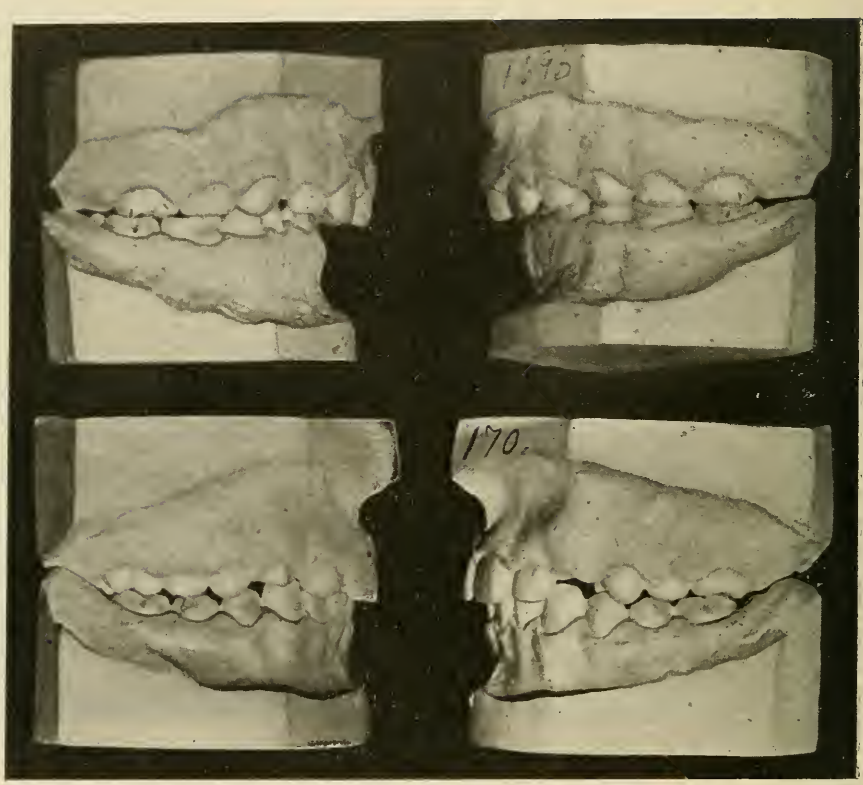

Fig. 10A.

standing that the malocclusion would grow worse and that later the treatment would involve more time, be more difficult and more expensive. The case, however, was never treated in any way, and to-day, at ten and a half years of age, the occlusion is practically perfect, and no amount of treatment in two years and a half could have bettered the result that Nature has accomplished unaided.

Fig. 5—Shows the occlusal and front views of the mouth of a girl, aged nine years. When this child was about three years of age the parents were advised to have the ligament between the two upper front teeth burned out and the teeth drawn together. Later, when the child was about six and a half or seven years of age, they were again advised to have the arches widened and the front teeth straightened—the lower incisors were crowded and the arch was slightly narrow. The parents neglected to have the work done, the case was never treated, and to-day the child's teeth are practically normal, except for a very slight narrowness in the lower canine region.

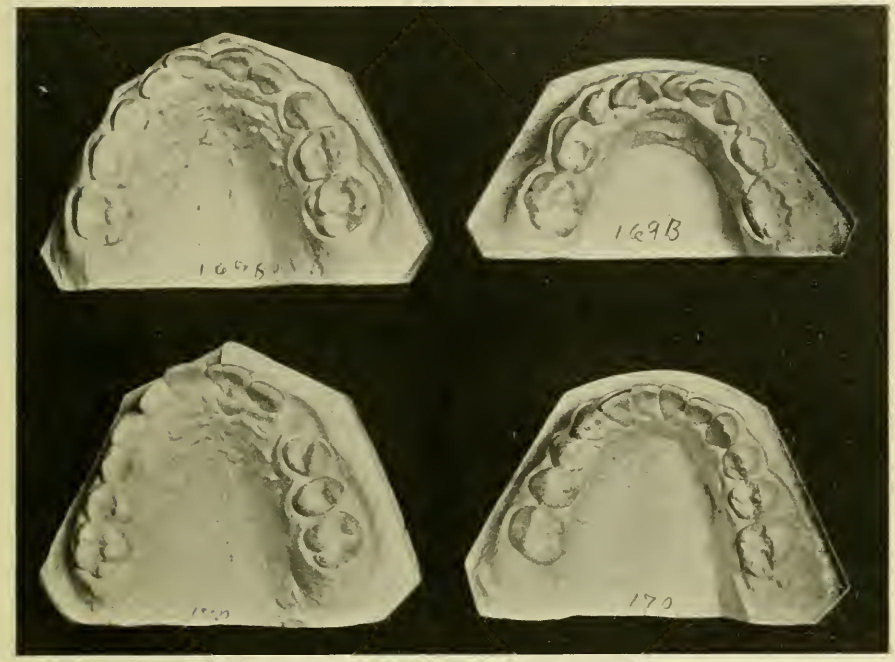

Fig. 10B.

Fig. 6—Shows where a right upper canine .30 of an inch in width has forced itself into a space .15 wide by pushing the other teeth aside without greatly disturbing their alignment.

Figs. 7A and B—Show the "before and after" models of a child who has been under treatment for five years, and who still has appliances on the teeth. The original model, so far as I am able to diagnose the condition, was practically normal, and, I believe, if the case had never been treated in any manner the result would be better than it is now after five years of treatment.

Fig. 8—Shows a somewhat similar condition in the mouth of a child between six and seven years of age. The upper arch is well developed, the deciduous incisors and canines are spaced and the arch is to all appearances normal. The lower arch is slightly narrow in the region of the incisors and canines, but very slightly. The parents have been advised to have these arches expanded and the lower central incisors rotated. If it were my own child I would not think of disturbing the natural development that is taking place there at this time.

Fig. 9—Shows the casts of the mouth of a child six years of age, and indicating a very decided tendency toward a Class III condition. I felt

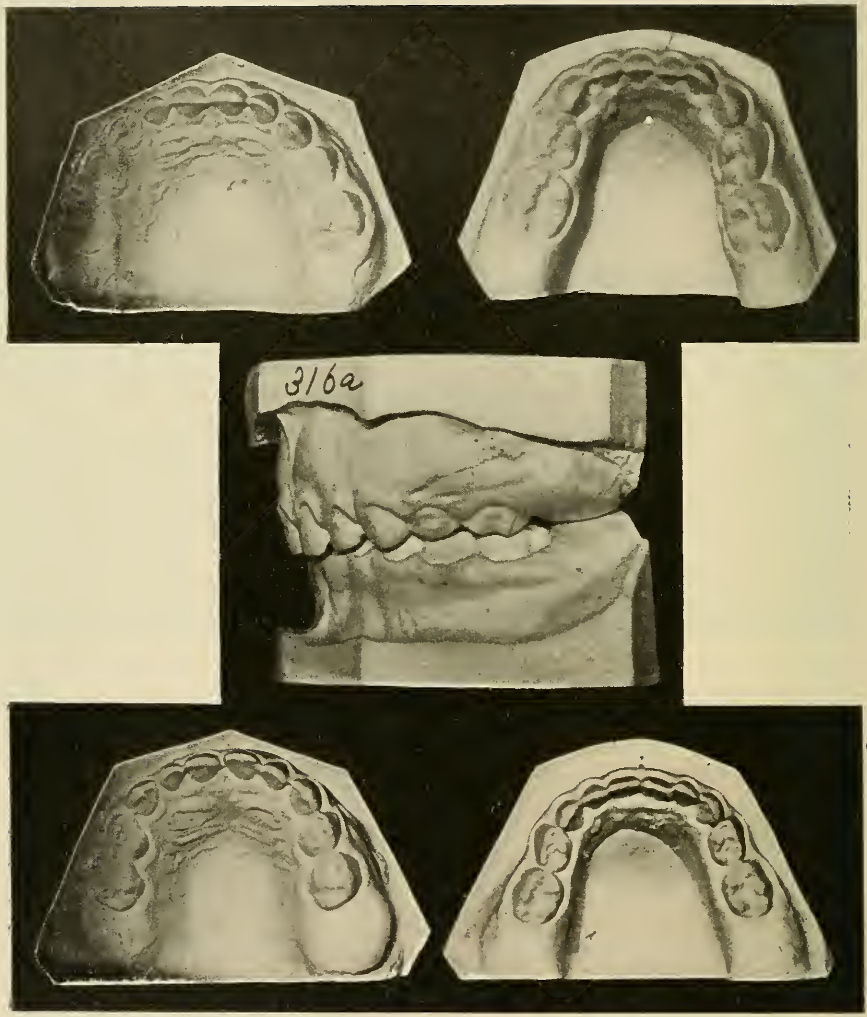

Fig. 11.

that this malocclusion should not be allowed to continue, and therefore treated it immediately. Within about six months the result was most satisfactory; all retainers were removed and the deciduous teeth remained in nice position, but when the permanent teeth began to appear the lower incisors erupted quite lingual to the deciduous ones, and as the transition progressed there was a gradual drifting toward what you see in the second set of casts, a subdivision of Class II. As I see this case now

I have no assurance that the permanent teeth, had it not been treated at all, would have erupted into a Class III position; neither is there evidence that any harm would have resulted from a delay of two or three years; perhaps they might have erupted normally, instead of drifting into the position as shown; who knows?

Figs. 10A and B—Show the casts of a Class II case that I began to treat when the child was a little past four years of age, and I have been treating it more or less ever since, which is about six years. This does not mean that the teeth have had appliances on during all of this time, but that they have been under supervision for this length of time. The arches in the original casts were fairly well developed and the child had a fair amount of masticating surface, and the child was therefore not suffering physically from the malocclusion. In such a case to-day I would postpone treatment till a later age, with the feeling that the same result could be accomplished with a less expenditure of time and energy for both the patient and the operator.

Fig. 11—Shows the case of a child five years of age, in which the teeth of the lower arch closed entirely inside of the upper; there was no masticating occlusion whatever. Here is a case in which I believe very early treatment is advisable in order to give the child a fair masticating surface. The lower arch was expanded, and the upper arch was contracted slightly, which brought the molars and canines into occlusal contact and gave the child a masticating occlusion. The teeth were retained in this position for a short time, and the case was dismissed for a period of two or three or four years; or, in other words, treatment is to be taken up again at any time when it seems to be needed. The side view shows the position of the teeth, mesio-distally, as they were when treatment was discontinued. I left them in Class II malocclusion.

Conclusion.

I am firmly convinced that a large percentage of the treatment of cases of co-called malocclusion in the mouths of young children is entirely unnecessary, and that in many of these cases Nature without interference could and would do the work far better than any orthodontist could possibly do it.

Discussion of the Paper of Dr. Kemple.

Dr. H. A. Pullen, Buffalo.

The concluding paragraphs of Dr. Kemple's paper, in which he states that the fewer and simpler the appliances and the shorter time they are on the teeth the better, presents ideas of rational treatment with which we can all agree, but the essayist has so modified his more radical assertion as to the age when treatment should be begun, and as to the extent of the influence of such treatment, that when I think I have found a point of disagreement in part of the paper I am confronted by a preceding or succeeding modification of the point on which we might disagree.

As to the proper age for treatment, the essayist prefers the age of nine or ten, but admits that "no fixed rule can be made which will be a safe one to follow in all, or even in the majority of cases."

If I were to take a census of the average age of the patients in the practice of orthodontists generally, I believe that the age of nine or ten would be found to be the prevailing average. I am more than willing to agree that the infant in arms of two, three or four years of age is too young to treat except in cases complicated by bad habits of thumb-sucking and mouth-breathing, etc., where perhaps some mechanical work is necessary to assist in breaking up these habits. There is a very good reason for not attempting to develop a dental arch at the age of two or three, and that is, that the artificial stimulus of treatment is unaided by Nature, the period of most rapid growth not supervening until within a few months preceding the eruption of the central incisors. In a two-year-old child there is nothing to develop, so to speak, but there may be malocclusion which ought to be corrected before six years of age.

For example, if a Class I malocclusion of the deciduous teeth presents with one upper half of the arch in lingual occlusion, the widening or expansion of the upper arch unilaterally before the eruption of the first permanent molars or the upper incisors appears to be rational and admirable treatment, more in the nature of preventive treatment, as it were. By such treatment the arrested development is corrected and normal development initiated, so that there is a better opportunity for Nature as an orthodontist to do her work. In other words, Nature as an orthodontist cannot begin until this kind of malocclusion is corrected, and if not corrected, Nature is helpless to prevent more serious malocclusion in the crowding of incisors and lack of lateral development, etc., which ensues.

Another example of wise early interference, as it has been called, would be in a Class 3 deciduous malocclusion. From my experience in these cases at five or five and one-half, I believe that the restoration of normal mesiodistal relations of occlusion also gives Nature the best chance for normal development, which opportunity, if missed by advising later treatment at ten years, allows five years of abnormal development of the dental arch and maxillary arch and of the facial muscles which are likewise affected.

Class 2 cases, I believe, will respond to such development better if begun after the eruption of the first permanent molars, and upper central and lateral incisors, but even in these cases I believe that eight years of age is not too early for treatment. Early treatment and control of the developing dental arches in these cases would seem to be our only hope of final retention.

In regard to the malocclusion of individual teeth, torso-occlusion of recently erupted permanent teeth also seems to call for immediate treatment, as their retention is more permanent in every case than if allowed to continue long in torso-occlusion.

Influence of Treatment on Associated Structures.

The paper strikes a hard blow at all of the newer theories in regard to the influence of treatment of malocclusion and development of the dental arches upon the growth of the directly and indirectly associated structures of the internal face. The essayist states that these theories are "purely presumptive," that they are statements of what we would like to believe might take place.

I do not believe that the essayist would like us to believe that these theories are simply "scientific imagery," or products of the imagination alone. There is always another side to every question. In other words, every theory is debatable. The other side of this question under consideration is debatable as well, whether we arrive at any absolutely proven conclusion or not. We must have certain workable and tenable theories in orthodontia, even though some of these theories are difficult to demonstrate as facts. One of these theories which the essayist especially ridicules is the influence that treatment of malocclusion may have in stimulating development of regions closely associated with the alveolar process, or as remote as the antral sinus, the sella turcica, the seat of the pituitary body.

I do not think that this theory of development of associated structures through orthodontic treatment is so hard to believe. The essayist has not presented any arguments against the support of this theory. It seems to me that we have macroscopic if not microscopic evidence of the growth induced by orthodontic treatment. Impacted teeth erupt quickly many times when freed from pressure, and the developmental area surrounding them is stimulated by treatment. The beneficial results to the nasal regions, while not evident from the appearance of the structures, exhibits often such restoration of normal function as is clearly noted.

There is as much reason to believe in the increased development of the nasal regions as a result of orthodontic treatment as there is reason to doubt it. The only facts with which the essayist attempts to overthrow this theory are the measurements of some skulls which vary in the relative proportions of the dental arches, nasal sinuses, etc., and in view of the fact that these skulls were perhaps not typical of the general average, I do not believe the measurements warrant the deduction that the size of the dental arch has nothing to do with the size of development of the nasal spaces and antra.

In support of the theory that dental arch development is related to the development of the superimposed nasal structures, it might be suggested that the interrelationship of function is evidence of at least some interrelationship of structure. If bone grows as a result of mechanical stimuli, and the extent of that development is measured by the stress, than the development of the osseous structures in continuity of the dental arches ought to exhibit some results of the stress of occlusion. If the function of occlusion is increased by orthodontic treatment, the result of increased function ought to influence the growth in the nasal structures in some degree proportionate to the increase of function in the dental arches.

May I ask, "What is the extent of the influence of orthodontic treatment?"

The essayist answers this by saying that the benefits to hundreds of children are seen on every hand. "Behold them and judge for yourselves."

I infer from this that he feels the child is benefitted physically. Can we limit these physical benefits to areas not inclusive of the nasal regions or even the regions higher up in the internal face, which are contiguous in structure to the osseous structures of the jaws. If not, then the influence of treatment of malocclusion must extend to all contiguous tissues, to the dental arches, the nasal regions, and the internal face.

I have no doubt, however, that the caution of the essayist against too early treatment and too long treatment of young children is well advised, and as a general principle I heartily agree with him. As to the extent of the beneficial influence of dental arch development, I do not believe we have as yet overshot the mark in our theories of the extent of that influence, although they cannot be always proven.

Dr. Milton T. Watson, Detroit.

I want to congratulate the essayist on having the courage of his convictions, though his attitude on this subject is somewhat more pronounced than my own. If we would print one particular paragraph of his paper in italics, I would be quite willing to simply endorse the paper and let it pass, hoping by this means to tone down the few radical ones and trust the others to take care of themselves. The particular paragraph referred to is the one in which he says: "I do not believe that any fixed rule can be made which will be a safe guide to follow in all, or even in the majority of cases. Conservative judgment, based on careful observation and experience, must always be the safest foundation upon which to place our decision." This paragraph states an axiomatic truth, and yet gives us sufficient latitude, so that any one of experience who has studied this problem carefully may feel that he is still well within the bounds of reason and good practice, even though he may occasionally treat little four or five-year-old children, as Dr. Kemple does himself sometimes.

As Dr. Kemple has told you, orthodontia has gone through exactly the same experience that every other branch of the healing art has, namely, going from one wild extreme to another. This all leads to the conclusion that years of experience and intelligent observation is most essential, if we wish to avoid serious mistakes, and that we are all dependent, in a large measure, upon the observations and deductions of all intelligent and reliable operators who have preceded us.

I have been greatly interested in this particular subject for years. and it was not until after careful observation of a large number of cases that I came to any definite conclusion in regard to the need for orthodontic interference in children as young as four or five years of age. I have histories of some of these cases running back ten years or more, and of the cases that I have been able to keep track of, every child—of otherwise average development—who showed utter lack of increasing development in the temporary arches at five years of age, either required subsequent treatment or now has malocclusion.

I am firmly of the opinion that all Class II and Class III cases should be put under treatment as early as it is possible to handle the child with a reasonable degree of comfort, which usually will not be earlier than four years of age. I do not, however, believe that this will, in the majority of cases, entirely prevent malocclusion in the permanent denture, but it still has many advantages by way of lessening the degree of the future malocclusion and in balancing the development of the external face as well as the deeper structures, to say nothing of the effect on the masticating efficiency and the respiration. I believe it to be clearly our duty to advise treatment of young children, rather than to wait until a later time in all cases where there is a *well-marked* insufficient development, and especially if the structures under consideration show a tendency to much slower growth than the other structures of the body. Every one of us has doubtless had the experience of treating simple cases belonging to Class I, where they came under observation just about the time the temporary molars were being lost, and within a comparatively few months we have been able to establish eminently satisfactory occlusal relations, which we have been able to maintain with comparative ease, but it is equally true , on the other hand, that a large percentage of the cases belonging to Class I, which are allowed to go without attention until eight or ten years of age, show such a marked elongation of the incisors, as compared with the molars, that the treatment is decidedly more complicated, and the satisfactory retention of such a case infinitely more difficult, with a much greater chance of a result only partially satisfactory; therefore, good judgment must, after all, be our guiding influence.

Cases from Practice.

As a matter of curiosity, I have carefully gone over twenty-five cases, taking them just as the models appear in my cabinet, the oldest of whom is eleven and one-half, with the following result:

In seven of these cases, belonging to Class I, the lower incisors were striking the gums just back of the upper incisors, and in several of the cases to such an extent that the treatment is much more difficult. These seven cases were respectively seven and one-half, eight and one-half, seven, eight, eight and one-half, ten, and eight and one-half years of age. Another case, eleven and one-half years of age, belonging to the Second Division of Class II, shows such a marked elongation of the anterior teeth that I have very frankly told the parents that I do not expect a result that will be entirely pleasing from an aesthetic point of view. There are among these twenty-five cases two belonging to the First Division of Class II, one four years of age and the other four and three-quarters, one of which already shows an excessive supra-occlusion of the lower incisors.

I am firmly convinced that the cases belonging to Class I, where treatment has become complicated by inharmony in the degree of eruption of the anterior and posterior teeth, and which represent nearly one-third of the cases mentioned, would have been handled much more easily if the treatment had been started at an earlier age, and that the degree of success attained would have been more satisfactory. My own experience, however, leads me to the conclusion that it is only rarely indeed that a child under four years of age can be successfully managed, and that it is not always the part of wisdom to start the treatment even then, notwithstanding the fact that the case clearly requires orthodontic interference.

I feel that the essayist is a bit pessimistic when he says: "We do not know that the bony structures which underlie the alveolar process are stimulated to any greater or better development through orthodontic measures than they would be without it." We certainly have most convincing evidence that the lack of occlusion and of the stimulating influence which it exerts does interfere to a marked degree with the development of the true bone, as shown by the experiments of Dr. Lawrence Baker, as reported to this society some years ago. If the mechanical destruction of the natural stimulating influence has such an apparent effect, what other conclusion can you possibly draw than that to supply, mechanically, a somewhat similar stimulation, where the natural forces are lacking, will have its effect on the same structures? At any rate, until positive evidence to the contrary is shown, I believe we should be guided by such apparently strong evidence.

Relation of Oral and Nasal Spaces.

That the proof of an actual enlargement of the nasal spaces through widening the upper arches is not conclusive, is, of course, the opinion of many men, though we all agree that normal respiration is improved in the majority of such cases, and this being true, it is certainly logical to do the operation as early as possible, for no one, so far as I know, doubts that the performance of its normal function is essential to the highest development of any organ. Is it not also true that in overwhelming numbers we do find a rather definite relation between the oral capacity and the breathing capacity, though the shape of the nasal spaces may vary greatly, being either wide and not very high or narrow and much higher?

Any child who shows a marked furrow or crease in his tongue, where it folds upon itself for lack of room, needs to have his oral space enlarged, in my judgment, regardless of age, and when it is done his breathing will usually improve, and it is not of prime importance whether this improvement is all due to providing a place for the tongue, so that it is not crowded back into the naso-pharynx, or whether a part of the improvement is due to an actual increased growth in the nasal spaces. In fact, it is quite possible that Nature will determine this point for herself as soon as she is relieved of the original handicap.

If it could be proven conclusively that just as good results can be obtained by delaying treatment until eight or ten years of age, I would be delighted, for it would certainly confine our responsibility to a much shorter time, and would relieve us of the burden of overcoming the extreme timidity which is so often present in the beginning with four or five-year-old patients. I must say, however, that it has only been on the rarest occasions and in the very simplest cases that I have been able to give a patient final dismissal in two years, which Dr. Kemple mentions as the minimum time required for some of these delayed cases.

Many conditions are self-corrective, and in such, interference should, of course, be studiously avoided. My chief criticism of this paper is that the casual reader will be led to draw a false impression in regard to the class of cases where such conditions really exist. I am, however, in perfect accord with Dr. Kemple when he warns against the "early treatment doctrine" as a positive rule for all cases.

Dr. C. A. Hawley, Washington, D. C.

This is an extremely valuable paper, and the conclusions drawn by the author are worthy of careful study and thought. I think the time has arrived for us to draw more carefully the lines and know more of the conditions under which we should commence early treatment and when we should not. Dr. Kemple has, I think, carefully drawn those lines. If you begin the practice of orthodontia with unbounded enthusiasm, with the idea of treating every case that shows a departure from the normal immediately, you will soon realize that this is a view from which you must recede. The cases must be very carefully considered.

I do not want to repeat the discussion that has already taken place, but to consider the matter from the viewpoint of the question as to how much treatment will interfere with the normal function of the child's teeth. If we start the case at five or six years of age, we must continue the treatment of the case in some form, with appliances or retention, and have some appliance on the child's mouth for five or six years. This interferes with the function of mastication. Of course, it depends somewhat upon the skill of the operator. If an operator is able to so carefully fit his appliance and so carefully continue treatment that the function of mastication and normal development is not interfered with, well and good. But there are cases in which the appliances are irritating and where they continue to interfere with the function of mastication, the cleansing of the teeth, and what normal development there would be.

What is normal in a child at different ages and what is abnormal, I think has not yet been carefully determined, that is, as regards development in the width and forward movement of the arch. We know that distocculsion is not normal, nor is mesiocclusion normal, but just how we can judge the state of development at different ages has not been determined.

Examination of Child Skulls.

I have been interested in the last two weeks in examining a number of skulls of Indian children, and have found some things that I did not expect. I think you will remember I showed you several years ago at Denver some slides of cases of children who had come to my office at different ages and not received treatment. For example, one at four, some at six, some at eight, some at ten, and some at nine. These children had not received treatment. Comparison of the same arches at different ages disclosed the fact that there was no development. I examined the other day something like eighty skulls of children under the age of twelve. They were Indians, Mexicans, and some Esquimaux, all people in a primitive state. I took my charts as standard of development in the examination of the skulls. The width of the arches in children under five years of age was considerably below the normal. I took the measurement of the second deciduous molar and compared it with the second bicuspid of the permanent arch chart. I found seventeen children under five years of age, and all of them were from that standpoint underdeveloped, and not very different from the civilized children who come to us to be treated. I did not find nearly as much space between the anterior teeth as I would have expected. That is difficult to determine, because most of the incisor teeth have been lost from the skull on account of the conical shape of the roots. From the age of six to twelve I found nearly fifty, and as near as I can determine you can call practically every one of them normal across the first molar, indicating that from the age of five to ten and twelve there had been great development, far more development than in our children. I noticed also that the cusps of the temporary teeth were worn absolutely flat, and many of them half way to the gums, and we could fairly draw the conclusion that the development was due to use in mastication.

Coming back to the question of treatment, I think we ought to take into consideration in using an appliance how much we are going to interfere with the function of mastication. I agree largely with Dr. Kemple that many of these cases by poor judgment can be overtreated. We may leave an appliance on for too long a time. We may interfere too much with mastication, the very function we should try to stimulate and the function which seems to be the cause of development in the arches of primitive races. In the matter of simple underdevelopment it is a question whether some of these cases would not do just as well if we let the children go until they were ten years of age, provided the function of mastication were properly exercised.

Dr. R. Ottolengui. I would like to ask Dr. Hawley how he determined the age of these skulls?

Dr. Hawley. I judged those under six by the fact that the first molars were not erupted. We have to keep in mind all the time that the Indian child erupts its teeth earlier than the white child. I could see permanent molars in the crypts, but unerupted. In the same way I judged the age from the loss of the other teeth and position of the second molars, the second molars erupting near eleven and twelve. You can make a fair guess in that way.

Dr. Wm. T. Watson. I want to emphasize one point Dr. Hawley has brought out, because it is the most important thing that has been said in connection with the discussion of this subject, and that is in regard to the stimulating influences of the natural use of the teeth. I think the slides of many of the children who apparently require treatment show that they would get along nicely without treatment if there were a possible way to induce vigorous exercise of the jaws. I believe lack of jaw exercise to be one of the predominating evil influences in the production of malocclusion.

Dr. J. Lowe Young, New York City. I would like to compliment the essayist on his paper, and particularly on his courage to come out as he has in the open. Let me call your attention to one point that has not been touched on; if it was, I did not catch it, and that is what takes place when we move a tooth. To move a fully erupted tooth we cause resorption of bone on one side, and this bone must be re-formed or built up in order to have the tooth remain in its new position.

Nature's way of building bone is so difficult to understand that it is very, very doubtful if we ever move teeth slowly enough to harmonize with Nature's laws.

As the roots of the deciduous teeth are resorbed, the bone surrounding them is also resorbed, and as the permanent tooth erupts, new bone is also built up to support it. Is it not logical that a tooth guided to its proper position during the period of eruption is far more liable to remain in this position and have bone developed in a more physological manner than if allowed to erupt into a malposition and then be moved? This is the reason why I am very much in favor of early interference in these cases.

Since I have been using the new Angle appliance I have studiously avoided attaching the arch wire to an erupting tooth with a pin. In many cases I have been able by means of delicate springs attached to the arch wire and extending lingually to the erupting tooth to guide it into its proper position and not interfere with the natural process of eruption, or at least to a very slight degree.

What I said last year was that I did not think there was any mechanical appliance ever devised which would move a tooth exactly as Nature does it during the process of eruption, but the nearer we come to Nature's way of moving a tooth, I believe, the better.

Dr. Federspiel. Why not let Nature do it?

Dr. Young. If she will do it, let her, by all means.

Another point I wish to speak about is the wearing of appliances during the entire period of eruption of the teeth when treating young patients. In my judgment, it would be folly to have a child wear appliances during all this period. I would advise expanding of the deciduous dental arches sufficient to accommodate the four incisors, and after their eruption all appliances may be removed from the mouth until the teeth that replace the remaining deciduous teeth begin to erupt. If these start in malposition, I would then use some simple appliance so as to guide these teeth into their proper positions during the period of eruption. This particularly applies to teeth requiring rotation.

Bicuspid teeth can be banded without any annoyance to the patient, just as they peek through the gum, and at this stage of eruption can be rotated in a few weeks, and after three months retention may be liberated.

This method of treatment necessitates more appliances than if the child were allowed to wait until he was ten years of age, but the satisfaction of knowing that the teeth will remain in their proper position after the full compliment of permanent teeth have erupted, except the third molars, more than compensates for the extra time spent in making appliances.

My best results have all been in cases I have treated early in life.

Dr. V. H. Jackson, New York City. I would like to say a few words on this subject. I recommend placing all teeth in proper position while erupting or as soon thereafter as practicable. That statement I made several years ago. Dr. Guilford included it in his text-book. I have been an earnest advocate of the early regulation of the teeth for many years. An apparatus can be constructed so that no especial discomfort or pain should be caused the patient from its use.

Finally I planned and have employed a permanent record system and an apparatus governing the exact amount of force applied at each visit, usually at intervals of once a week. I have a young patient in whose case there is a considerable amount of space between the upper deciduous incisors and the lower ones, the upper arch protruding very much. Shall we not begin to treat these cases as early as possible with a suitable appliance, getting the tissues equalized and functionating so that Nature will build the necessary tissue into a normal form while the arches are in their most active developmental stage? If so, how long should the appliance be kept in place? I would reply, continue the treatment just as long as is necessary to permanently correct the condition. Continue the treatment with the child just as one would in treating an adult, even though it is sometimes necessary to continue the treatment a considerable length of time. We generally get better results from early treatment, and it is necessary that we do the best for our patient, regardless of the length of time consumed.

I am presenting models here of a case of a child four years old, with narrow arches and distal occlusion, which illustrates some of the conditions we have mentioned.

No organ of the body will properly develop unless it is functionating. A delay in regulating often encourages nasal obstruction.

If a child's lips do not close properly, and there is protrusion of the upper incisors, a serious condition of the occlusion will usually be brought about if neglected for two or three years.

We should correct these conditions early, causing the lips to close normally and know that the nose is functioning properly, that is, being employed rather than the mouth for breathing.

At the clinic here I showed the models of a case of a child four years old, having lack of lateral harmony of the arches, where, I am sure, if it were our child we would not be willing to delay its correction.

Impacted Molars.

We had a beautiful illustration of an impacted third molar, shown and described by Dr. Ottolengui. Although the subject is not now before us as to how we should treat impacted molars, I will make a few remarks regarding it. We need not follow the old practice of the general practitioner of dentistry in extracting all impacted third molars; it is our work as orthodontists to save these teeth. We go to college to learn how to save teeth. Of course, if the position of the third molar cannot be corrected, it should be extracted, but we should relieve the impacted molar by orthodontic methods, tipping the molar to an upright position. I shall be glad at some time to go over that matter and tell you what I am doing. I am saving these third molars in almost every case. Where one is so deeply imbedded in the bone back of the second molar that Nature cannot force it to proper position, we need not always necessarily resort to general surgery for its removal, but it is our duty to save the molar by forcing distally on the crown to dislodge it, and at the same time control congestion by proper medication. It is unreasonable to say that an impacted molar of a patient, eighteen years of age, should so generally be extracted. The third molar does not normally erupt until the age of eighteen to twenty-one. Why should the profession be so active in removing these teeth, especially before the jaw has reached its maximum adult dimensions? The treatment amounts to the controlling of the swelling with antiseptic applications, and tipping the molar backward.

When there is swelling, one can readily get rid of the swelling and infection by forcing iodine with iodoform crystals freely under the gum into all pockets. This is usually accomplished in the ordinary case by the use of a small curved probe with cotton wound about it, and moistened, picking up a quantity of iodoform crystals, dropping iodine on the dressing by a drop bottle, and forcing the probe under the gum around the tooth, reaching into every pocket as far as may be. This lessens the swelling and permits the ordinary absorption of the tissues to go on without the danger of infection. If the third molar through its abnormal position has become firmly locked with the adjoining molar, the bony and soft tissues can be dressed away from over the enamel portions and at the same time force be applied for its correction. The molar can be first wedged from the adjoining one and when necessary an apparatus with a metal finger be applied for forcing the molar backward sufficiently to dislodge it. I have accomplished this with springs of different forms. A simple method is illustrated in my "*Orthodontia and Orthopedia of the Face*," page 413, Fig. 484.

Other methods I have employed I shall soon describe.

Dr. George B. Palmer, New York City. I just want to say a word in connection with Dr. Kemple's paper which came forcibly to me while he was reading it. When I started in orthodontia I began with great enthusiasm to treat everything in sight. I would treat cases four or five years of age when I could get them. I soon concluded to treat nothing until the first permanent molar had erupted, and about four years ago in speaking with Dr. Kemple about one case he said he would not think of treating it if it occurred in his practice. However, I treated the case, which was one Dr. Kemple showed this afternoon. The patient was five or six years of age, and would have been better off if I had left the case alone. So I honestly believe that in the great majority of cases these patients are much better off at eight or nine years of age than where we treat the deciduous teeth.

Dr. Kemple. There is little that I can add in closing this discussion. I fully recognize the fact that it is more important to guide an erupting tooth into its proper position than to allow it to erupt into a serious malposition; but the point that I wish to make is simply this: Are you *sure* that the tooth will be in serious malposition when it is fully erupted?

Probably any orthodontist would have treated the first case shown on the screen at seven and a half years of age—I am frank to say that I would have treated it myself—and yet in a little over two years, without any treatment whatever, the teeth are in splendid position, this result being better than could possibly have been obtained by any kind of orthodontic interference. It is better because it came about through a perfectly natural development, and there is no probability of the teeth "going back."

If a child is suffering from nervous strain because of impaction and crowding of the teeth, it should be relieved. But not all cases of apparent malocclusion at six or seven years of age are suffering nervous strain, or any other kind of strain, from impaction. A very small per cent. of the cases that are treated at this early age are treated because of nerve strain; they are treated early because the idea has gone abroad that every case must be treated early, at the first symptom of malocclusion. In one case shown, treatment was advised at three, at six and at seven years of age, by three different orthodontists. The parents neglected to have the work done, and now at ten years of age, without having had any orthodontic treatment whatever, these teeth are in almost perfect normal position. I do not believe any of us could have obtained better result than Nature has accomplished in this instance. I am heartily in favor of treating every case that really needs treatment, but I am strongly opposed to treating any case that does not need it. I have no definite rule for these young cases, but I am learning every day to have a greater respect for Nature's method if she is given half a chance to do her work.

The Relation of the Internal Secretory Organs to Malocclusion, Facial Deformity and Dental Disease.*

By Clarence J. Grieves, D.D.S., Baltimore, Md.

In presenting this paper the writer desires first to admit his limitations and to make an explanation, if not an apology, for so much has been claimed which cannot be substantiated on the question of the endocrine or ductless glands and their presumed function, that real physiologists are apt to look askance at the man who mentions their relation to any etiology, and his reputation as a therapeutist is at stake, if he even suggests organo-therapy.

Much of this distrust is well founded in the past experience of those who have been misled by the wildest flights of the so-called, but spurious, "scientific imagination"; real scientific imagery, says a recent review, "(1) whether we call it by that name, or designate it as a tentative hypothesis or a working plan, is the incentive that spurs to the highest scientific effort." Professor D. Fraser Harris (2) of the Dalhousie University has brought together in print some instances in which an idea first represented by a metaphorical expression has in time become clothed into reality; oxygen was merely a principle to Lavoisier in 1777, and when a century later it was produced in liquefied form "the metaphor had become an actuality." In physiologic chemistry, the synthesis of the active principle of the suprarenal glands represents "the crystallization of a notion; the thing of the mind has become the thing of the laboratory; the thought has been captured and bottled." "Thus it is sometimes given to the man of science," again says Harris, "to touch, to taste, to handle what was once only a notion, a suggestion, a forecast, either in his own day or that of a less fortunate predecessor." "The fabric of medical progress, indeed, of all progress is woven from legitimate dreams to a greater extent than the practical man is wont to realize or willing to admit."

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*This paper, to which additions have been made, was read before The Academy of Stomatology, Philadelphia, Pa., May 26, 1914.

In the light of this pronouncement, in spite of the fact that we have been at times awed and hushed by the statement that the dentist should better stick to the filling of the teeth, as the shoemaker was one time told to stick to his last; we still believe that any science is our science if it be ever so remotely involved in our work, and an effort will be made to assemble certain of these facts from widely variant sources into a working hypothesis. Not one item is here submitted but what has been proven by at least three investigators, either in the laboratory, the clinic or by organo-therapy; even so, there remain sad gaps in this, as in every new theory, which have to be bridged by probabilities, all of which will be noted; there will be much error, no doubt, but if one little strand of truth can be made to correlate into a real etiology, where hitherto, in these conditions, we have been doubtful it will be beyond the hopes of the writer.

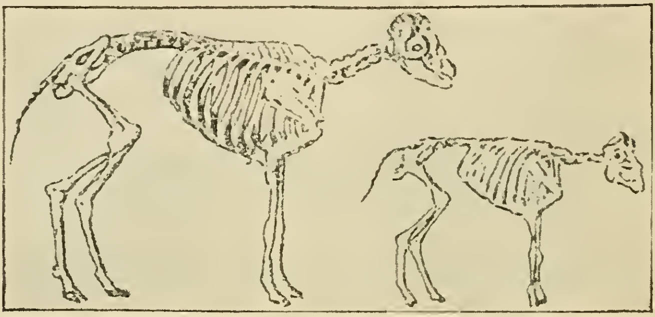

Fig. 1.

First. We will attempt to show that at least three of the internal secretory organs are necessary to the maintenance of life and nearly all of them preside, each in its own way over bodily growth, nutrition and metabolism of proteids, sugars, starches, and fats; that they are of particular interest to us in relation to the connective tissue group, from mucoid tissue to bone and dentin, including the epithelial product, enamel; that they control alkaline store houses in the bones, including waste and repair of the same, particularly of calcium and sodium salts; that there is an intimate connection between these organs and the sympathetic nervous system in all its nutritive processes. As Starling (3) has explained, this means of tissue communication through a chemical or hormone, discharged into the blood stream, is the primitive method before the formation of a nervous system, and it is the only method active now in the lower life forms; but greater specialization called into being, first the sympathetic, and later the central nervous system, for more rapid communication; nevertheless this primitive form of chemical stimuli has been retained in its inter-relation with all the group and in partial control of the great nervous systems.

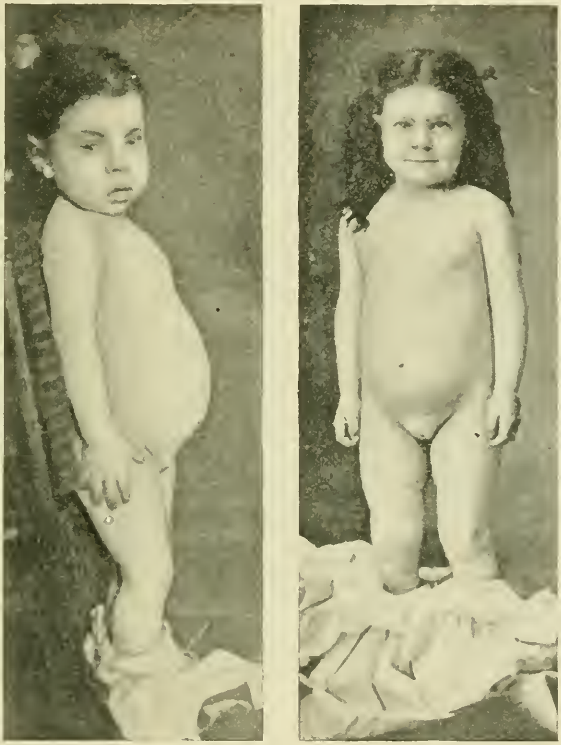

Fig. 2.

Second. That all of these tissues and glands co-operate with or compensate and inhibit each other in cycle, so that any interfering influence or disease which disturbs this co-ordination, seriously and very diversely, affects nutrition, bodily development and function according to the time at which it occurs, before or after puberty, with the most marked effect at the periods of bodily stress and change, *i. e.,* from birth to tooth eruption; the first and second dentitions; puberty and menstruation; pregnancy and lactation in the female; the climacteric and senility in both sexes; that the internal secretory organs have each a special function in these important periods besides that of growth, presiding over parturition; controlling sex and sex characteristics; promoting lactation and maintaining immunity to infectious diseases in the infant, and all of this cycle is peculiarly susceptible to damage from the infectious diseases of childhood, as scarlet fever, measles, chicken-pox, whooping cough, etc.

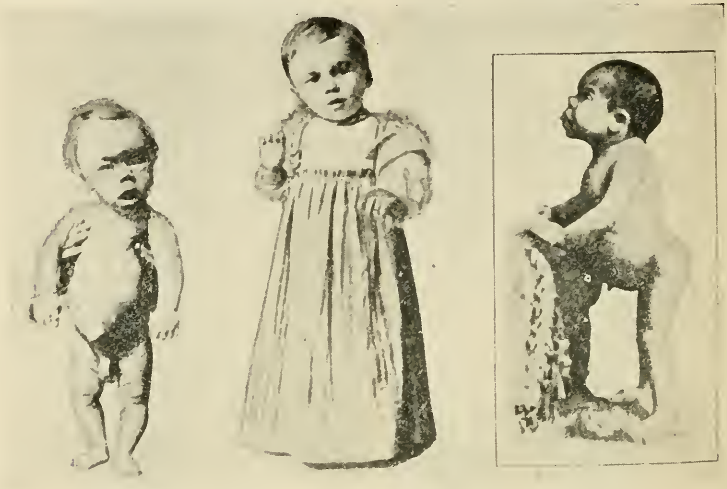

Fig. 3.

Third. That normal development of the bones of the face and the base of the skull; the proper growth and articulation of these with the base of the skull; the growth of the nasal and post-nasal regions and accessory sinuses and the eruption of the teeth, all depend upon the correct functioning of these organs in their correlation with the sympathetic nervous system. Insufficiency or disease in any one, will interfere with the synchronism of the whole, causing various forms of deformity; as in the major expression, for instance, thyroid disease producing cretinism and myxedema, and pituitary disease producing acromegaly and giantism, all affecting facial regions; as in the minor expression, glandular insufficiency producing the different forms of malocclusion and defects in the teeth and their eruption. That the "stress of dentition" both temporary and permanent, together with all of its attendant serious reflex neuroses, is produced by such glandular insufficiency and trophic disturbance, interfering with the necessary synchronism of bone development. That tooth formation and the development of the dental follicle after birth, possibly before; the enamel organ and dentin germ and their fixed products, enamel and dentin, and the other dental tissues, which may be repaired, dental pulp, cementum, peridental membrane and alveolar walls are controlled by this cycle, defective functioning of the same being

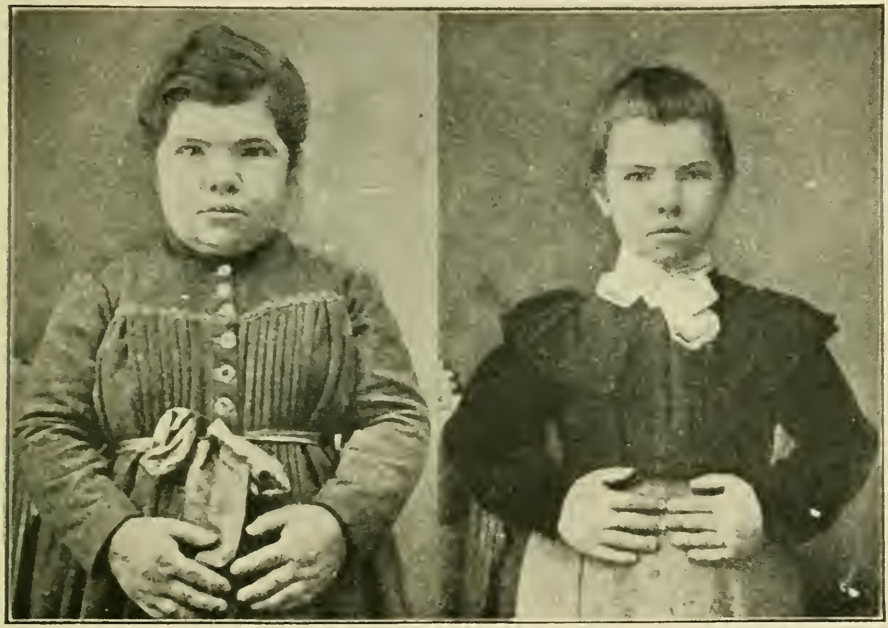

Fig. 4.

illustrated in a highly cancellous alveolus and root resorption: enamel hypoplasias and opaque spots; microscopic defects in enamel rods, which often symmetrically occur in all four of a group of teeth, the first molar, for instance (being subject to early caries, which Waller mentions), and interglobular dentin areas, etc., etc. That, at least, a part of the etiology of dental caries may be explained by the function of these glands in sugar metabolism as shown by Kirk (4) and many other obscure conditions of the mouth and saliva (witness the unexplained relation of the testes and pancreas to salivary glands) all associated with the wasting of the tooth surfaces, may be accounted for by defective calcium and sodium metabolism and excessive waste of body salts, and all these are in a way under this glandular control.

Fourth. That there is an increasing percentage of malocclusion observed in both dentures, particularly the temporary; the premaxilæ and the maxillæ frequently fail to develop downward and forward normally; and the palatal processes of the maxilla do not develop antero-laterally to the norm, with the result that the first maxillary molars, instead of always being in correct position as claimed, are nearly always in lingual relation, according to Bonwill's rule; and who can say just what normal occlusion is, in the temporary denture, as related to facial angles? That this narrow and too distal eruption of teeth locks the whole occlusion and face in distal relation, particularly if the mandible appear to pass mesially as in Class 3, as noted in the frequent mandibular prognathism of cretins, preventing the downward and forward growth of the accessory sinuses; possibly preventing pneumatization and drainage of these sinuses; that early glandular insufficiency may affect the development of the base of the skull and sella turcica, disturbing pituitary function; that defective premaxillary development often deflects the nasal septum and all of these produce dental impaction and the "stress of dentition."

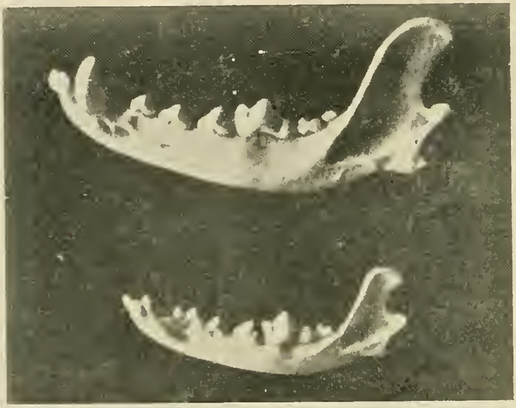

Fig. 5.

Fifth. That hypertrophy of the pharyngeal, and faucial tonsils is common to so many children with normal temporary arches as to constitute primarily not the cause, though after it persists, it may be, of malocclusion and defective facial development, but is coincident with both and is, we believe, produced by the same defective internal secretory influences (34) in their control, or the lack of it, over the thymus and lymphoid tissue (35), which caused the malocclusion; that the percentage of children suffering from malocclusion, adenoids and hypertrophic faucial tonsils is identical: and that hypertrophied tonsils are not necessarily infected, which is secondary, due to hyperplastic conditions.

Sixth. That the part played by the gradual evolution in maldevelopment of the face, caused by a lack of use and civilized food habits is recognized, but we hope to show that the most important time for study of defects in facial and post-nasal growth is the period from birth until the eruption of the temporary teeth, where use, save that of function by heredity, could have no effect; that the neglect of breast feeding when correctly augmented later by cow's milk and solids is an important factor; that exclusive bottle feeding deprives the child of certain activators common to healthy mother's milk, which are intended to start the entire internal secretory system to early function, of which growth of bones and teeth is a part, at a time when it is needed most. That the internal secretory organs of bottle-fed babies, on the contrary have to await this process of growth, and that they arrive finally to function, but too late, after mischief is done by delay in this early period. And it can be shown with certain exceptions, such as rachitis, the etiology of which is not clear, that herein lies the cause of the failure to develop, or of development in the wrong direction of the face, teeth and sinuses and the coincident enlargement of pharyngeal tonsils, for the percentage of children with adenoids, enlarged faucial tonsils, and malocclusion are the same as for bottle feeding or defective breast feeding; and bottle feeding has long been clinically associated with these deformities.

Fig. 6a.

Fig. 6b.

Seventh. That organo-therapy, when intelligently and conservatively exhibited, *is said to have done much to correct these facial defects in cretinism and in-*

fantile myxedema, without the help of the orthodontist; its use by the co-operation of the specialist of internal medicine, supplemented by calcium and phosphorus feeding is suggested in a selected number of cases for study, while the orthodontist applies mechanical measures. That enough data on the rapid widening of the maxillary arch is in hand, no matter what the method nor what the discussion of effect on the palate, sinuses or sella turcica to prove that there has been rapid nutritional improvement of the child, out of all proportion to the effects we might expect from sinus pneumatization and drainage; these cases must be studied in connection with all specialists interested, as they suggest stimulation of the pituitary and neighborhood tissues to growth and function. Finally, that while bone development is assisted by modern orthodontic methods and by correct relation and use, it frequently is not maintained, nor are the teeth permanently retained, without proper function of these internal secretory organs presiding over bone growth and calcium metabolism; and, this may explain the failure of good retention and the necessary repetition of orthodontic procedure, which no doubt might be avoided by intelligent supplemental organo-therapy.

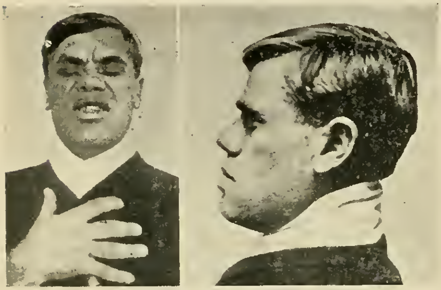

Fig. 7a.

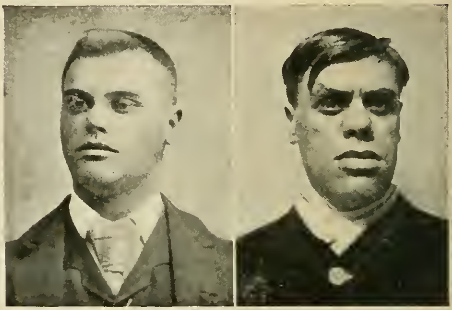

Fig. 7b.

Eighth. That all statements relative to the internal secretory organs are to be accepted with the greatest caution; a "Scotch verdict" is much safer than blind acquiescence, particularly as applied to our work; and *so great are the dangers of organo-therapy, that no dentist should attempt it without the internist to watch all body symptoms.* On the other hand all observations on mouth conditions reported by physiologists as improved by organo-therapy must first be confirmed by orthodontists and dentists who are more familiar with normal occlusion, for many cases, as Class 2, have returned to what only appeared to be normal by such simple expedients as the adenoid operation, etc., etc. That the part which variation and heredity play in the formation and eruption of the teeth and development of the face, must never for a moment be forgotten in the study of these conditions. One of the principle objects of this paper is to emphasize the pathological as compared to what might be called normal variation produced by deficient internal secretion (we might add that this is the daily problem of all those who study and treat disease), and to suggest to you Hasting Gilford's (3) theory that insufficiency of this whole internal secretory cycle may also be inherited and run through a family or race leaving its facial imprint.

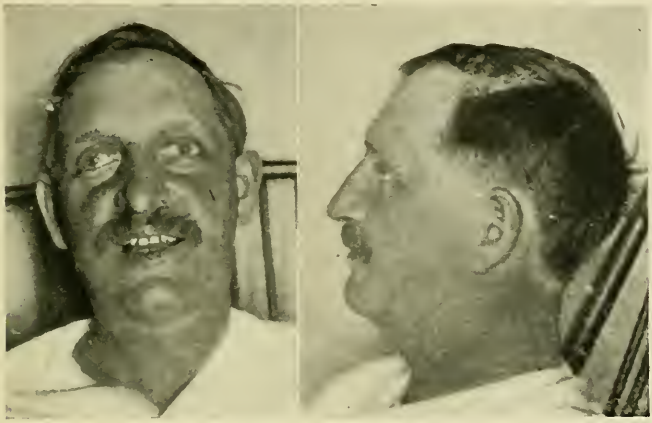

Fig. 8.

The following quotation from a recent paper by Tandler (32) defines the writer's idea exactly. He says: "While fully appreciating the overwhelming results which have been attained in orthodontia within the last few years, we cannot but admit that the theoretical basis for the facts which have been practically confirmed, is yet in many cases deficient. As in many other fields of medical science, therapeutic success has here anticipated the scientific argumentation. Our want of theoretic knowledge relates particularly to two points, viz: (1) To the knowledge of the etiological factors causing malocclusion; (2) To the knowledge of that formal transformation of the skeleton which we are enabled to obtain by therapy.

"As to the first point, we have not yet advanced beyond the realm of vague supposition. Regardless of the fact that only a single reason would be given in supposing mouth-breathing to be an etiological factor in certain types of malocclusion, it should be taken into consideration that mouth-breathing itself again must depend upon certain etiological factors. Though we know that mouth-breathing originates by organic changes which obstruct the nasal respiration in some way or other, we need not infer, of course, that these organic changes must be of merely local nature, and do not rather represent partial symptoms of some general constitutional quality. Only exact researches into the constitutional idiosyncrasies of persons with malocclusion can elucidate this question.

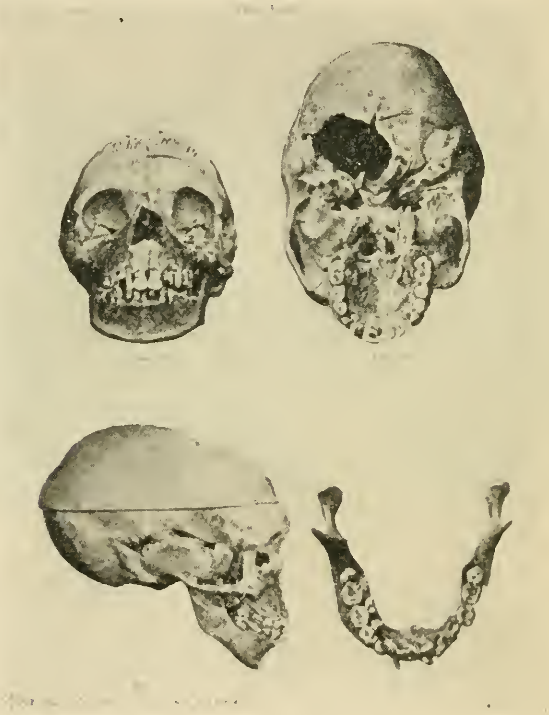

Fig. 9.

"We may mention here the high palate and narrow jaw in degenerated families, where it can hardly be assumed that we have always to deal with mouth-breathers, also the deformities of the jaw in thyrogenic constitutional anomalies, such as are to be found, for example, in endemic cretinism. In these cases we have to deal with people who, although having absolutely flat palates (Fig. 9), prove to be pronounced mouth-breathers.

"However, not only constitutional factors, but likewise congenital diseases, such as hereditary syphilis, are responsible for the shape of the cranium and the jaws. Therefore it is open to doubt whether this determination of shape is a direct or an indirect one; whether the syphilis acquired in utero itself modifies the jaws, or causes the modification only by producing changes at the base of the cranium, especially at the sutures and synchondroses. The general diseases contracted in early youth, as, for instance, rachitis, should be considered from a similar point of view. The rachitic changes of the cranium and the facial bones without doubt determine the shape of the jaws and consequently the occlusion. How important are the general points of view regarding particular organic changes, and including therefore anomalies of the jaws, may be deduced from the vast modifications which the jaws undergo when the normal function of some of the ductless glands is disturbed. We need only to mention here the abnormal function of the pituitary body in acromegaly, which is accompanied by an extraordinary growth of the jaws and separation of the teeth (Figs. 7 and 8). This fact is all the more important since the extirpation of the pituitary body is followed by a diminution of the jaws and consequent recovery from malocclusion. Here, certainly, it would not be correct to speak of mere local conditions.

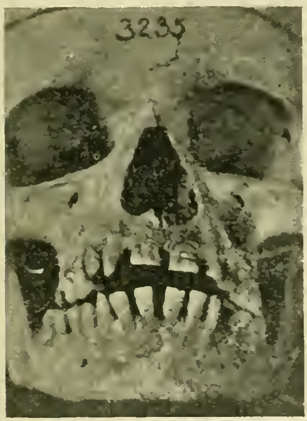

Fig. 10.

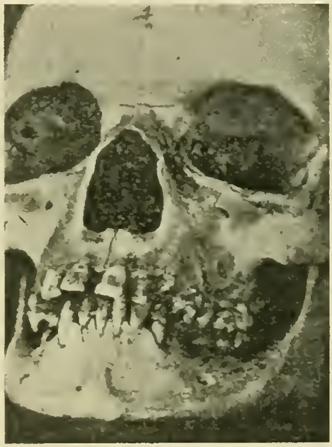

Fig. 11.

"Here may also be ranged the changes at the base of the cranium and in the facial bones found in individuals with thyrogenic processes. If the dentition, in its later development, really represents the expression of the normal function of the glands with internal secretion (ductless glands), then, by the disturbance of these functions, changes in the dentition must be caused, accompanied, of course, by disorders in the development of the jaws and by malocclusion."

Recognizing the defects in any attempt at classification for study of the internal secretory organs, they may for our purpose be divided into two groups: the major, because of its vital importance, consisting of the thyroids and para-thyroids, the pituitary body and the thymus; the minor made up of the suprarenals and chromaffin system as associated with the great sympathetic and trophic processes, the sexual glands, testes in the male and corpus luteum of the ovary and mammary glands in the female, all of which, except the mammary, whatever their other secretory function, furnish an internal secretion or hormone. Finally, the pharyngeal and faucial tonsils, not secretory organs, but involved in this consideration as a part of the post pharyngeal lymphoid area, closely concerned with phagocytosis and clearly related in the lymphoid cycle to the thymus. These tissues are so often changed normally, in all of the stress periods mentioned, that histologists disagree as to just what the normal really is and the statements proceeding from animal experiment, clinical experience and organo-therapy are equally contradictory. However, an effort will be made to condense these findings, in the time permitted.

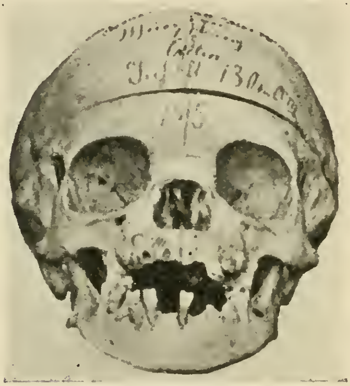

Fig. 12.

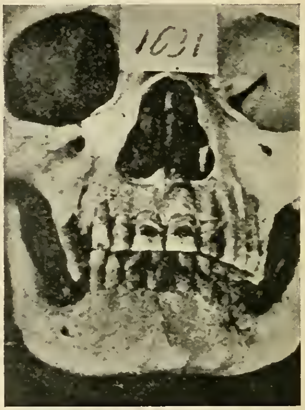

Fig. 13.

The Thyroid.

Osborne (5) says: "The physiologic activities which the normal thyroid is expected to furnish may be summed up as follows: It is a necessary stimulant to growth in childhood both bodily and mentally; it takes an active part in the deposition and distribution of fat and in nitrogen metabolism; it is an active opponent of nitrogen poisoning; without its activity proper genital development is impossible and secretions of the genital organs are imperfect. It takes an active part in the function of menstruation and in development of the fetus in pregnancy; during such periods it furnishes an extra amount of secretion. If it does not do so, the menstrual function is imperfect, the woman during pregnancy is abnormal and parturition is likely to develop eclampsia and the child be born a cretin."

Cretinism.

Cretinism is a mark of thyroid insufficiency in the child as is myxedema in the adult; Goiter and Graves disease indicate hypersecretion of the gland; hence it frequently becomes exhausted and insufficient in these conditions, and the goitrous mother finally produces a cretinous child. All authorities agree that, in the cretin (Fig. 1), early gone growth is delayed, there is premature cessation of development of the base of the skull (Figs. 9, 10, 11, 12), and of the root of the nose, which is broad and flattened (Fig. 2), the lips are coarse, tongue enlarged, skin yellow and leathery and hair is scanty. Biedl (6) emphasizes the fact that puberty is retarded, endochondronal ossification is incomplete, many epiphysis remain unclosed, and Schoneman (10) furnishes ample radiographic proofs of degeneration of the hypophysis cerebri in cretins. "The (3) cretin of twenty-five years of age is stunted (Fig. 3), pot-bellied and ugly, with the intelligence of a child four or five years." Waller (7) emphasizes the fact that there may be many phases of these facial defects leading up to actual cretinism (a partial cretinism without the mental deficiency), due to a small thyroid insufficiency in the child, just as there may be phases of childhood myxedema, and Biedl is especially interesting when he sums up the whole matter thus: "The (6) clinical picture presented by thyroidless children is very suggestive of that of cretinism." We would especially accent the similarity of the facial defects of real cretinism to the worst cases presenting for orthodontic treatment (Figs. 2 and 3), and that these defective arches, particularly maxillary (as in Class 2), malocclusion generally associated with enlarged tongue and mandible and adenoids have all been corrected, according to many authorities, by feeding the child thyroid extract. *This is a practice needing immediate and most careful investigation by orthodontists.* We would emphasize the statement made by Ott (8) in which all authorities again concur "that a proper amount of thyroid secretion is of especial importance in the early extra-uterine life," one of the periods named in the synopsis, when so many developmental processes are happening to teeth, sinuses and face, many of which, if they go wrong, cannot be repaired, such as enamel defects, hypoplasias, etc. (Fig. 13).

It is equally important that we thoroughly understand the assertion made frequently, that "Suppression (6) of the thyroid is followed by a decreased irritability of the sympathetic nerve and this in turn is manifested in a sluggish circulation and in certain trophic disturbances," because trophic processes are those involved, so far as we know in bone and tooth-root absorption and rebuilding; (Fig. 9) tooth eruption and formation, and possibly accessory sinus formation. If these processes are not normally timed, there is "stress of dentition" caused by delay and impaction, frequently resulting in malocclusion, which in turn aggravates these neuroses of faulty dentition. "This (5) gland has some control not yet clearly understood over the central nervous system and the blood and its products," but most important to us as dentists, is its relation to the nutrition of the great connective tissue group (Fig. 4), both in the child and adult, illustrated in myxedema, "which occurs in women to the total of eighty per cent. and may be readily passed on to the child."

Myxedema.

Myxedema is the adult expression of hypothyroidism, producing atrophy of the genitals, ovaries and testes, blunting mental activity, slowing speech and cerebration, reducing proteid metabolism and the amounts of phosphoric acid and carbonic acid excreted, producing hyperplasia of the connective tissues, which Starling and others describe "as a real interstitial growth of these tissues," enlarging the face and tongue, and this may also exist in minor degree during childhood (Figs. 2 and 3) and adolescence and is also claimed to be relieved, by thyroid feeding. It is very suggestive that this hyperplastic condition can occur in children, and it may account for enlargement and protrusive development (Figs. 10 and 11), and the failure to contract and turn downward of the premaxillæ, as shown in the study of these bones by Mosher (18), which, after the defect occurs, become ossified into various phases of Class 2. If true, this will indeed explain much hyper-development of these areas.

Hyperthyroidism.

Hyperthyroidism produces Goiter in endemic and other forms including Graves' disease, and is the exact obverse of myxedema and cretinism; over-function often leads to the compensatory enlargement of the gland and frequently thyroid insufficiency in both mother and child. So endemic cretinism in children and animals (Fig. 1), depending apparently on drinking water, is quite common in goitrous districts, one of which "in France in 1873 (6) totalled 120,000 cretins." Biedl's remark, "That thyroid insufficiency does not present cretinous or myxedematous symptoms in the child early or at birth, but that they develop later because the mother's organism sufficiently supplies the fetus with thyroid for the early extra-uterin period," is interesting when read, in the light of the statement, by many physiologists, "That (6) the thyroid presides over lactation, supplying its secretion through mother's milk to the child, and, to prove this, he quotes Spolvarine's studies of myxedema (9) in several sucklings nursed by strumuous or hypothyretic mothers or nurses, "whose milk," as he says, "did not contain the thyroid substance in sufficient quantity" to activate the child's internal secretory organs.

The Parathyroid Bodies.

The parathyroid bodies, always existing as two or more, are associated with the thyroid, the loss of all of which produces death, usually by tetany, are particularly active in calcium metabolism. Erdheim has produced resorption and softening of bone, dentin, and enamel in rats by partial parathyroid removal; it is to be noted that these were rodents with persistent pulps and enamel organs where such resorption is histologically possible by way of the blood stream, and it is to be regretted that there is no record of such experiments on the teeth of mammals, without the persistent pulp. Since this was written the wonderful work of Peter Krantz shows the same results on dogs, pigs and sheep, with changes in size and shape (Figs. 5 and 6) of the dentin and enamel organs, all of which were produced by interference with the endocrine organs and then often corrected by organo-therapy or implantation. (Deutsche Zahnheilkunde in Vortagers, 1914.) A study of the salivary changes would also be most instructive in this connection. "Tetany (8) can ensue in lactation, in rickets and in pregnancy. There is a juvenile tetany and a tetany due to gastro-intestinal diseases." Howland says: "Those who believe that lesions of the parathyroid are the cause of all cases of tetany point to the abnormal teeth often seen with it as a proof of their contention, but tetany seldom occurs without rickets. and it is hard to tell whether it is the tetany or the rickets which affects the teeth." The defects in the teeth, according to the age at which the attack occurs, clinically associated with tetany and rickets, are summed up by Fleishman (9) as follows: "The dentin toward the root of the tooth is quite free from lime; enamel hypoplasias in goblet or basin-shaped cavities or in circumferential rows (Figs. 10, 11 and 13) mark, not only one, but all of a group calcifying at the same period," and he stoutly maintains that these conditions, which were formerly blamed on rickets, are produced by tetany and hence due to the parathyroids. (The writer would call Dr. Ottolengui's papers on root resorption to your attention in this connection and emphasize his discussion of the last one.)

Tetany has been relieved by calcium feeding and parathyroid implantation. MacCallum (11) sums up this very obscure matter by saying: "It is certain that they (the parathyroids) exercise a peculiar, and very important, function in preventing the appearance of an extraordinary change in the circulating fluids, which produces extreme hyper-excitability of the whole nervous system..." "There is much evidence that it produces or even consists in a disturbance in the metabolism of calcium and that the parathyroids control this." One physiologic fact stands out to the dentist, that in the thyro-parathyroid glands we have two organs, *which by internal secretion have to do at the same time with metabolism of calcium and the nervous system*, with all of the connective tissues and enamel, which latter they help to form, and, that, when disturbed, they can produce overgrowth or undergrowth of these tissues by the way of the blood stream.

The Pituitary Body.

The hypophysis or pituitary body, consisting of the pars anterior, pars posterior and pars intermedia, when absolutely extirpated, produced death and functions differently for each part. Out of the mass of contradictory evidence we quote Cushing as follows: "The pars anterior (12), so far as we can tell, presides more intimately over skeletal growth (Figs. 5 and 6); whereas the posterior lobe has been shown to be more closely allied to the processes of tissue metabolism...an insufficiency in it causing a marked deposition of fat and it is also associated with the activity of the renal and vascular systems." As this gland has to do with growth and sex characteristics, it is in close touch with the sexual glands and is always enlarged by pregnancy, castration, etc., hence lesions affecting it produce symptoms according to the period at which they occur, before or after puberty, or when the skeletal growth is complete. Approximately, it may be said, that hyper-pituitarism, with hyperplasia of the anterior lobe, before puberty and depending on epiphysial ossification produces giantism, while after puberty it produces acromegaly. This is a discussed point, and Cushing says: "Acromegaly (12) cannot precede giantism, but may be grafted on it," therefore it is incorrect to associate acromegaly with childhood (Fig. 7). In giantism, a lesion occurring before puberty, there is excessive growth of the long bones with marked exostoses and persistence of the epiphyses; hypoplastic sexual conditions, impotence in men and cessation of the menstrual period in women. In acromegaly, a lesion occurring after puberty, enlargement (Fig. 7) occurs in bones already complete, including the mandible and occasionally the maxilla (Fig. 8) with spacing between the anterior teeth, which tip outward; enlargements of the hands and feet, nose, larynx, tongue and lips, including the antra and frontal sinuses. Biedl says: "Investigations (6) of the histology of these bones show that these results are due to deposition and resorption of bone substance as in normal growth."...

Cushing makes a classification, dyspituitarism affecting facial regions (Fig. 8). You are referred to his work on this subject (2).

Hypopituitarism.

Hypopituitarism, where many symptoms are common to the hypertype, is marked by stunted skeletal growth (Figs. 5 and 6), forms of dwarfism, genital hypoplasia and infantile sex characteristics, with great deposits of fat; Cushing (12) mentions nasal prominence, due to sphenoidal distortion (Fig. 8) as contrasted to mandibular enlargement in acromegaly; there is a particularly high sugar tolerance and a preference for large amounts of sugar and carbohydrate food; sugar, as such appears in the blood, and it is notable that Cushing (12) and others insist that other endocrine bodies besides the pituitary enter into the sugar question, as the thyroids, parathyroids and adrenals. It is said that both these conditions are the result of struma in or near the pituitary, producing pressure, illustrated by the neighborhood symptoms, as on the optic nerve causing hemianopsia, and the gland may hypo- or hyper-function, finally ending in glandular insufficiency.

The significance of all of the foregoing to the dentist is, that he should differentiate acromegaly from mandibular protrusion from other causes (compare Figs. 7 and 8 with Figs. 10, 11 and 12) and be able to recognize the tilting forward of the anterior teeth and increase in interdental spaces. *The orthodontist should bear in mind, no matter what his theory, from the numerous cases showing improvement in the pituitary syndrome, that it may yet be possible to relieve some of these symptoms by spreading the arches, possibly by drainage of the ethmoidal and sphenoidal sinuses, relief of lymph blocking or of the circulation; the forces acting in some way not known; but he should never speak of relieving pressure in the basilo-sphenoid and allowing the pituitary to sink from sellar decompression, by widening the arch, for that is impossible mechanically and anatomically,* and he should always bear in mind the fact that "the base of the skull is an entity."

There is not sufficient time to go into this important subject and you are referred to the clinical evidence of Hawley, Barnes, G. V. I. Brown, and Price, and to the numerous papers including that of C. M. Wright, M.D. (33), which we paraphrase briefly as follows:

Dr. Wright shows that "malformations, which interfere with normal performance of physiological function of the accessory sinuses of the nose, together with interference with the lymphatic circulation within the nasal fossæ, are directly responsible for such intercranial conditions." Explaining the relation of the emissary veins, the foramen cæcum and the circulation of this region, he quotes McClellan's Edition (*Reference Handbook of Medical Sciences,* 1901): "In children there is always a communication between the nasal veins and the superior longitudinal sinus through the foramen cæcum; this is usually closed at puberty, but may continue in the adult." Having proven the venous stasis in these conditions, he shows that the same cause will produce lymphatic stagnation, quoting Cunio and Andri, to the effect "that the peri-meningeal spaces communicate with the lymphatics of the nasal fossæ across the cribriform plate of the ethmoid by canals, which are independent of those for the sheath of the olfactory nerve." Tilly is quoted to the effect that "direct communication between the lymphatics of the olfactory region and the basal lymphatics of the dura mater has been demonstrated beyond a doubt," and Wright concludes that "this lymphatic stagnation, then we must admit, plays an important part in the sequella of nasal obstruction, affecting the function of the base of the brain and its contents." In the light of the foregoing orthodontists and surgeons should not be over-hasty in their judgment of the validity of the claims in certain well-authenticated cases presented by experienced clinicians, which appear very much to the writer as the relief of lymph blocking and return to function of a circulatory stasis.

The Thymus Body.

The thymus body* increases in size from the embryo up to the second year, after which it functions and gradually involutes at puberty; it occasionally persists when this cycle is defective, particularly after castration or in early hyposexual states. That it presides over bone growth is shown by the fact that "the (8) femur of a thymected dog only contained one-half as much of the tricalcic salts as the control, and the bones could be cut with scissors"; when the thymus is insufficient, "artificially produced fractures unite only by connective tissues." Ott says: "The alkali depot in the bones acts as an antacid depot. The thymus is, perhaps, in the young animal the chief organ for the synthesis of nuclein; its removal would leave the neuclinic and phosphoric acid to cause an acidosis: these acids dissolve the calcium salts or hold them in solution. Thymus extirpation causes, in animals, rachitis, osteomalacia and osteoporosis." The thymus is a lymph gland and the hyperthymic state, known as the status thymo-lymphaticus, is always fatal to children: there also may be many smaller phases of this generally hyperplastic lymph condition, described by Paltauf. It is therefore of interest to us in this consideration, for hypertrophic states of the pharyngeal and faucial tonsils and all the post pharyngeal region, have been associated with hyperthymic state in minor phase. As many unite in thinking that the thyroid controls the thymus (34), and, that it, together with the spleen, finally takes up the thymus function, an athyroses in the infant would permit of overgrowth of all the post pharyngeal lymph areas, possibly producing adenoids.

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*You are referred to the recent work of Halstead (34) who has shown the relation of the supposedly vestigal thymus in adult goitre cases to hyperthyroidism, occurring after thyroidectomy, demonstrating, that the association of these glands is more intimate than was supposed.

Cavarzan (29) claims that deficient function in the adrenals interferes with normal skeletal growth and reports forty-seven cases of osteomalcia cured by epinephrin administration; so no study of this subject is complete which overlooks the extremely important relation of the suprarenal bodies and the chromaffin system to the great sympathetic nervous system, which has so much to do in a trophic way with the development of the head and face. Chromaffin tissue exists alike in the sympathetic ganglia and the medulla of the adrenals. Starling says (3): "A list of the actions of adrenalin, the active principal of the suprarenals, is identical with a list of the chief functions of the sympathetic nervous system," and Biedl agrees that "adrenalin (6) is the hormone by which irritability of the sympathetic is regulated." Some of the functions of the sympathetic are: heart, muscle, and vascular tone and control of blood pressure; it also regulates the amount of sugar in the blood and glandular secretion generally as that of the saliva, for instance. We must remember, that it is these trophic processes, more or less blood to the part, which constitute the only acceptable theory given thus far on the obscure question of tooth eruption, the root and alveolar absorption that permits it, and the physiologic repair which rebuilds anew the alveolus. There is also a demonstrated relation of the chromaffin tissue in the adrenals and sympathetic to the same tissue existing in the islands of Langerhans (Cohnheim), in the pancreas, controlling carbohydrate metabolism and involved in the etiology of diabetes; and just as there is some unknown relation of the testes to the salivary glands in mumps, as salivary secretion is controlled by the sympathetic, we cannot but believe that this may have something to do with the carbohydrate content of blood, possibly the saliva in excessive dental caries during the stress periods mentioned in the synopsis.

The Sexual Glands, Testes in the Male; Ovary and Mammary Glands in the Female.

Castration and eunuchism have long been a proof of the internal secretory action of the cells of Leydig (interstitial cells of the testes), the hormone from which controls bodily growth and the union of the epiphyses. The phenomena of senility fairly represents the further hypoaction of these cells, but it is in the relation of the corpus luteum of the ovary and fetus to lactation, that our greatest interest centers. There is no better illustration of the inter-relation of all this group than in the development of mammary glands and milk secretion, which Starling and Clapon have proven can be produced independently of nervous control.

Ott (13) and Scott say: "That several glands concur to increase a secretion was well illustrated in that of milk, where we have five: infundibulin, pineal, corpus luteum (3), thymus and mammary." It has already been shown that the thyroid, parathyroids and pituitary are prominent in this cycle, as they are enlarged and finally depleted by continued lactation. Human milk is a composite of the blood content suited to nourishment of the child at different periods of growth, as proven by Starling in the increasing percentage, proportionate to age, of lecithin, a phosphatic fat constructive of the nervous system; immunity or disease of the mother can be transmitted to child by alexins and antibodies or toxins, which have been demonstrated by Welch and Ehrlich (3) in human milk, and it is probable, as all of these glands concur in its secretion, that their hormones exist as such in milk, to the early activation of the whole internal secretory system in the child. This point will be mentioned later. The compensatory and inhibitory action of this whole group is so complicated and little understood as to be merely mentioned; for instance, the thyroid, pituitary and sexual glands are said to co-operate, which seems likely, as all are disturbed by menstruation, pregnancy and lactation. The thymus and adrenals are thought to oppose this group (34); all of which is most confusing, so you are referred to Falta, Eppinger and Biedl. This whole phenomena of growth of the child is recently summed up by Hastings Gilford (14) as follows:

The Effect of the Ductless Glands upon Development.

"We find by virtue of their secretions, or in some cryptic manner, that they preside over certain correlations of the body. These correlations are by no means rigid, but indeed exceedingly variable, and the variability is most apt to be shown when circumstances are abnormal. The adjusting mechanism of development is not only flexible, but is more or less reciprocal, so that a ductless gland both influences development and is itself changed by general development."

"In this harmony, which is produced by concerted action of the ductless glands, we have reason to suppose that the leading part is played by the thyroid. This supplies a stimulus for the metabolism of the body as a whole. During infancy and childhood, when it it most important that the fires of metabolism should be controlled, the influence of the thyroid is checked by the thymus (34) and by the lymphatic system in general." "This brings about that delay of sexual activity which is so essential to proper maturation and stability of the somatic faculties." "Probably the first to break through the cordon of conservative influences is the adrenal system, which awakens the dormant sexual organs and hastens growth of the skeletal and muscular systems. Development is further stimulated by the pituitary, which awakens every organ in the body, including sex organs. These latter ripen now apace, and assisted by the combined action of the ductless glands, some awakening and some resisting, carry the development of the body on waves and ties to its flood." From the evidence quoted it is plain that the thyro-parathyroid apparatus is the controlling factor, active in child growth opposed or assisted by the poly-glandular syndrome; this has a most important bearing on our hypothesis relative to the excessive lymphoid state and hypertrophic pharyngeal and faucial tonsils as mentioned by Gilford when he says: "The thyroid is checked by the thymus and by the lymphatic system in general," while Gierke (15 "believes that the two glands compensate*" (34), at any rate it is probable that thyroid insufficiency or athyroses in infants, may allow increased thymus function and general overdevelopment of the post pharyngeal lymph area, thus producing anenoids, and it is a striking fact that the enlargement of both tonsils is coincident with delayed development of the face and arch, just as it is associated clinically with malocclusion, the percentage of children suffering from all these conditions being about the same. The statement of Waller (16) and Williams (17) that these enlarged tonsils have been reduced by thyroid feeding is very suggestive and needs thorough clinical study.

Norregaard calls attention to the close anatomic relation of the pharyngeal and faucial tonsils to the thyroid explaining that comparative anatomy shows a direct communication between this lymphoid area and the thyroid in some animals. Weglowski, who found traces of direct communication between these throat areas and the thyroid in thirty per cent. out of one hundred and fifty-three cadævers from the fetus to old age. It is Norregaard's opinion that a large percentage of thyroiditis arises from primary focal areas in the tonsils also illustrating this connection.

There is another very prominent factor causing thyroid insufficiency brought out by Waller (16) and accepted by many, *i.e.,* that nearly all of these glands are disturbed in function, hence rendered deficient in secretion, by early attacks of the infectious disease of childhood, measles, scarlet fever, chicken-pox, etc., particularly the thyroid, and, if as stated, this gland is controlled by the thymus lymphoid cycle, when its inhibition is removed, through damage from measles, for instance, there should be hyperplasia of all tonsillar tissue, which would shortly lead to hypertropic, tonsils and adenoids, which are open always to infection. As a matter of fact, adenoids are said to be produced by this very group of diseases, and as confirmatory of this statement, "a healthy internal secretory apparatus is considered the greatest safeguard against such diseases." It can now be accepted as proven that this cycle of internal secretory organs absolutely controls the formation of the facial bones, nasal and post nasal, as well as the teeth and their eruption: here too we believe it can be established that the thyroid function is predominant, any defect in which will act through all, seriously delaying development. Thyroid insufficiency and its expression cretinism in children is quite the commonest of all the marks of defective internal secretion, and we again call your attention clinically to the mouth and pharyngeal defects of pronounced cretinism (Figs. 2 and 3), the premaxillary protrusion, and irregularity of the teeth; the closed sinuses (Figs. 9, 10, 11 and 12) and deflected septa; the enlarged tonsils and tongue, and ask that you carefully compare these with the more minor defects we are called upon to correct. The enlarged tongue associated by medical observers with these conditions is a striking feature, and the question arises, did the hyperplastic tongue protrude the teeth or the narrowed arches crowd the tongue into the pharynx and produce mouth breathing, according to Cryer's idea? As deficiency in the cretin at first prevents development and the closing of the sutures and epiphysis in long bones, where they finally ossify in shortened relation as in the dwarf, with synostosis of the skull and face bones as Starling states (3), *why should it not in the child, suffering from athyrosis in less degree than in the cretin, delay the closing of all the sutures which go to unite the face to the skull?* viz.: the palate, sphenoid ethmoid, malar, nasal, frontal, vomer *and maxillary, and then close these undeveloped sutures in distal relation, preventing forward and downward development of the maxilla and mandible, locking the whole area in bad occlusion and interfering with full development of all the accessory sinuses and nasal septum?*

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*So definite is this relation that recently, 1914, Halsted, at the J. H. Hospital has gotten satisfactory results confirmed by histologists by destroying the remnants of the thymus by the use of Roentgen rays after the Basedowic symptoms persisted following successful goitre operations: the idea being that the thymus vestige picked up the function of the missing thyroid.

Time of Closing of Sutures.

We can consider now with profit the periods given by various anatomists, who do not all agree, for the closing of these sutures. The following description is but a brief outline suited to the time allotted this paper and is not exact. The body of the sphenoid is developed in two large sections, the post-sphenoid, containing the larger part of the sella turcica and the posterior clinoids; and the pre-sphenoid, containing the lesser wings and anterior clinoids, which unite to form the basilo-sphenoid, directly under the pituitary body, a little after birth, in the first stress period of growth given in the synopsis.

It is easy to conceive how a tendency to hypopituitarism might be induced thus early by delay in development of this area, previously ascribed to thyroid insufficiency by imprisoning the growing gland in undeveloped bone, all of which producing outspoken defects later; this is confirmed by studies of the sella in cretinism already quoted, and Gilford's report (30) of a case of ateliosis (arrested development) where he says: "The pituitary is apparently encroached upon by the projecting clinoid processes." Further, the greater wings, the third free portion of the sphenoid, at this period, do not unite with the basilar portion until the end of the second year, as these wings articulate with the palate bone, which in turn joins with the superior maxilla: they are the strongest sutures of the internal attachment of the face to the base of the skull. Cryer says: "They give support to the superior dental arch." *It is more than significant that nature leaves this whole area unattached, until all the temporary denture is fully in occlusion,* and that ossification is not complete between the basilo-sphenoid and the basilar portion of the occipital bone, until between the eighteenth and twenty-fifth year. The palate bone, the wedge which unites this whole area, through the greater wings of the sphenoid to the maxilla is developed early; ossification proceeding from two centers for the perpendicular plate, passes toward the articulating edges, which, due to any deficiency in internal secretion or calcium metabolism mentioned, might be delayed in ossification, just as the epiphysis under like condition, and produce a shortening, placing the whole maxilla in distal relation. The zygomatic portion of the temporal, which articulates with the similar process of the malar, bracing the front of the face, does not unite with the rest of temporal bone until well into the first year after birth. The crysta galli and perpendicular plate of the ethmoid, which assist in the anterior superior facial support, do not begin to ossify until the end of the second year, and the sphenoturbinates, entering into this articulation, are not attached to the sphenoid until the second or third year. The vomer, keying this region to the maxilla, develops from two lamina, inclosing the cartilage, by two centers, which are not entirely completed until puberty. Coming to the maxillary bones, the premaxilla are supposed to unite shortly after birth, but it is interesting to find Mosher (18) contending that they really are not completed until the third or fourth year; prior to that time, he says: "They are mere shells holding the temporary and permanent teeth and do not acquire solidity until the permanent incisors are well on the way to eruption." That the palatal processes of the maxilla rarely develop to full width is shown by the lingual relation of the first molar region, which in orthodontic work, nearly always needs expansion. You will, no doubt, associate all of these periods for the closure of this region, articulating the face to skull with Cryer's remark explaining how weak this union is to any force applied from within outward and also the striking resemblance in the times named for suture hardening to tooth eruption, which begins for the temporary teeth about the sixth to eighth month after birth, and is about complete by the second year; particularly the eruption of the first permanent molars which is between the fifth and sixth years. None of the numerous theories explaining the eruption of a tooth are satisfactory, just as are none of the theories for the formation of accessory nasal sinuses. W. B. Davis (19), in explaining sinus development, describes the formation of an embryonal epithelial pouch which lies against the bone producing absorption; this invasion is followed by the entrance of air or pneumatization, and this whole process is strikingly similar to the eruption and advance of a tooth; the bony crypts are resorbed only to be built again in sinus formation, just as a tooth advances. Whatever may be the primary cause, both of these processes come under the supervision of vaso-motor and trophic nerves of the sympathetic, which has been shown through the chromaffin system to be controlled by the endocrine glands or internal secretion, *any insufficiency in which, would interfere with the synchronism of all of this growth, which is marvelously timed in the normal.* If this be true, such defective secretion might well delay sinus development as well as cause irregular dentition, producing malocclusion and dental impaction, with pressure areas even impaction on certain nerves ending in the "stress of dentition" which Kirk (20) has shown may extend its neuroses and reflex irritation even up to the time of the eruption of the third molars. Josefson (21) presents, in a recent report, a mass of radiographs and clinical evidence to show that tardy dentition is a warning that development of the body is not progressing as it should and claims there is some disturbance of the whole ductless gland system. He recommends systematic organo-therapy (Figs. 2 and 3) during pregnancy in families with a tendency to abnormal dentition and growth of hair, and many medical observers insist that there is early resorption of roots and loss of temporary teeth in rickets and tetany, and quite the reverse in tuberculosis.

Feeding Infants.

When we consider the embryology of this whole question; the evident analogy of epithelial enamel and hair; the development of the maxillary arch, for instance, and the greatly divergent anlages from which the premaxillary portion has to descend and the palatal processes ascend; when statements such as Josefson's are daily occurring in medical literature, it behooves the dentist to prove, or as often disprove, every word of them. We believe one of the principle causes for internal glandular insufficiency to be the present method of artificial feeding of infants and that correct baby feeding is one of the keys by which we will unlock this problem. Cow's milk which may be modified to the correct percentage of protein, salts, and carbohydrate to suit the growing age of the child, is lacking in certain vital and yet unknown factors contributing to bone growth and preventing such conditions as tetany, rickets, etc. It has already been shown that immunity, as also disease, may be conveyed from the mother to the child by breast feeding, and that many internal secretory organs preside over lactation, particularly the thyroid; Bramwell and many others having increased the milk of wet nurses by thyroid feeding, and "it (22) is quite probable that some internal secretion, necessary for perfect nutrition, which is secreted in mother's milk, may be absent in cow's milk, hence bottle fed children may not receive it." Meigs and Harsh (23) report "that human milk differs in three ways from cow's milk, *i. e., first,* considerably more lactose; *second,* much less protein, and *third,* more substances which are important constituents of diet and are soluble in alcohol and ether, but contain no nitrogen, and whose chemical nature is unknown; in the middle period, human milk contains five per cent. of this substance, while cow's milk contains but three per cent." Starling and Clapon insist that these substances vary with different species, Starling saying: "It (3) is impossible, therefore, satisfactorily, to replace the natural milk of an animal by that of another species"; beside these activators of the internal glandular system, there are just as important elements such as various salts and particularly the lecithin content. Lecithin is most important in building the central nervous system and Starling proves, that we have a progressive adaptation of milk to growth, according to the lecithin content in each species: "(3) the calf's brain is only 1-370 of the whole animal with lecithin to protein 1.4 per cent., while the infant's brain forms 1-7 the body weight, with lecithin to protein 3.05 per cent.;" hence the infant would require three times as much lecithin as the calf, otherwise serious nervous disturbance might occur. It would then be quite impossible to start into early function the whole internal secretory system and nourish the infant's developing nervous system with manufactured baby foods; this cycle would be activated earlier with cow's milk, containing three per cent. of such substances, and 1.4 per cent. lecithin, but still there *would be that delay which we consider the real cause of all these dental ills, even with modified cow's milk; while with breast milk from a healthy mother, all of this syndrome of growth quoted from Gilford, would be started at once, in the early extra-uterine period, preventing, we believe, defective forward suture development, "the stress of dentition," enamel hypoplasias* (Fig. 10, 11 and 13), *and such symmetrical enamel defects as lay the tooth open to caries, etc.* W. A. Price (24) associates a number of cases of enamel hypoplasia with the use of artificial baby foods, and in a strong résumé, severely censures the users of such foods. In discussing this report Dr. E. C. Kirk (24) said: "It has been pretty definitely shown by a number of observers that the secretions of certain of the ductless glands, particularly the parathyroid, has something very definite to do with the process of calcification; that, where the parathyroid is destroyed or diseased, we may feed phosphatic food, and it is not assimilated and the quantity of phosphatic food that is taken to the stomach under these circumstances is rapidly eliminated in equal amount. It is also pretty clear, in the milk of the nursing mother, certain of these important stimulative properties of the ductless glands pass, and, though the child may receive phosphatic nutriment materials in some other form, it is the lack of this stimulus which prevents the child from assimilating the phosphatic elements of artificial foods." Many agree with Starling (3) when he says: "There is no doubt that, of the children dying during the first year of life, four-fifths are murdered by unnatural methods of feeding." W. H. Davis (25) states the fact that "the bottle fed baby is six times as likely to die as the breast fed," and while, no doubt, a good part of this percentage is due to intestinal diseases, there is another element in the generally accepted fact "that the bottle fed baby is much more susceptible to communicable diseases than the breast fed baby." We wish to accent again that Erhlich and Welch have proven the antitoxins which pass over from the mother to the child in human milk "will (3) provide it with a certain measure of passive immunity against possible infection by disease to which its species is liable." *Now all of this is most important, for it has been already established that the organs of internal secretion in childhood are peculiarily liable to damage, hence insufficiency* from just such early attacks, as measles, chicken-pox, etc. In the bottle fed baby this immunity is not maintained and causes glandular insufficiency, which from any cause will produce dental lesions and enamel hypoplasis, all of which have for years been associated by the dentist with such infectious diseases; it also explains the writer's series of such collected from children of tuberculous parents. On the other hand, quite as much harm has been done by too prolonged breast, without supplemental feeding or the insistence on feeding the child by the mother with defective milk; rickets and spinal deformities are quite common from this cause, all of which is made clear in recent statements as follows:

"It (22) is also quite probable that some children, even if breast fed, suffer from calcium malnutrition because of defective secreting glands (internal) in the mother; also one or more of the glands of internal secretion in such defective children may be acting insufficiently." The writer does not care to be classed with the breast feeding "faddists," but suggests that in the study of oral defects, all of these diverse conditions be reviewed and carefully tabulated; a sensible attitude is that of H. M. McClanahan (26) whose conclusion is, "unless the mother is suffering from serious illness, she should nurse her infant (*for these valuable activators**), supplementing such nursing by other feeding," and such is the practice in several large institutions where the milk of a few wet nurses is apportioned amongst all the children. Finally, the following statement from A. Hrdlicka, who has studied this whole question of the nasal passages, adenoids and tonsils, dental arches and teeth, in primitive people, from the standpoint of comparative anthropology, is convincing. Dr. Hrdlicka reports a study of over nine hundred and sixty Apache and Pima children, and from his broad experience he states, in all the children examined that:

First. "There was no abnormal narrowing of the maxillary arch nor protrusion of incisors and no irregularities, except sporadically a little crowding of the incisors, and that the arches are broader in the second temporary molar region than in the whites of same type of skull, with the bones generally heavier."

Second. "That in all his personal experience, he never saw a case of adenoids nor knew of a tonsilitis in an Indian child, although he made careful observations of the breathing of these children both awake and while asleep."

Third. "The Indians have had, and still have, the habit of keeping up the nursing of the child until the second or third year or even later, and the important fact was developed that the Indian mother gave her child various things to chew very early, while she still continued feeding late; here we have the double value of use of a natural sterile and easily digested food, supplemented early by more or less solid foods."

Fourth. "When asked if open air sleeping did not prevent adenoid vegetations among the Indians, he quoted many facts to show that often the Indian (the Pima, for instance,) slept under the worst possible ventilation; the mud hut is completely closed by blankets against air, and many sleep in one room."

Fifth. "He accentuated again his idea that evolution was going on in the human skull, face bones, base of skull and teeth, and that it is largely due, so far as the jaws, teeth and facial bones are concerned, to lack of use of the organs of mastication; this tendency to degeneracy due to disuse, and the

*Author's italics.

still advancing evolution must be recognized as an important factor in all of our considerations."

You are referred to Dr. Hrdlicka's numerous papers (27) on this subject, and *we would accent his statement, as to normal width of the temporary and permanent arches in Indian skulls, showing correct bony development of the palatal processes in the region of the first permanent molars, associated with absence of adenoids produced we believe by correct baby feeding and particularly early use.*

Calcium Metabolism. The metabolism of calcium and other salts, is so intricately involved in this question of breast feeding, the internal secretions and bone and tooth growth, that no consideration of the subject would be complete without mentioning it. You have heard how the parathyroids preside in some unknown way over calcic waste, which, if not relieved, in the youth if not in the adult, will so profoundly affect the nervous system as to produce convulsions and death, and that calcium feeding will often relieve such states, as it will post-operative tetany. As confirmatory of what has been said we quote a recent article, as follows: "Many (22) of the glands which have an internal secretion, the thyroid and para-thyroid, ovaries and testicles, pituitary and the thymus, in infancy and childhood seem to take a part in normal bone metabolism." "The calcium in the blood has been found to be highest in the child; it decreases slowly with age, being higher in breast fed than in artificially fed children, who seem to retain calcium longer and to store it; it is also more in evidence in breast fed infants, than in those who receive cow's milk. . . . ; coagulation of the blood will not occur except when the salts of calcium are present." Ott says (8): "Bones (*and we might add teeth**) are chiefly composed of ninety per cent. calcic phosphate and carbonate (*this refers to the inorganic percentage**); these are the alkali stores in bone; when the quantity of alkali decreases, these insoluble calcium salts become soluble. In the period of growth of the young there is a great breaking up of nuclear substance, forming neucleinic or phosphoric acid, which may circulate in the blood dissolving the calcium salts and causing an acidosis." "We (22) are more and more coming to understand that condition of the body which may be termed hyperacidity, or, at least, a lessened alkalinity especially of the blood—imperfect excretion of acids or acid salts by the kidneys or bowels will sooner or later cause some serious functional disturbance, some degree of denutrition or serious disturbance of the nervous system, and infant marasmus and gastro-intestinal conditions are due to diminution of alkalies."

*Author's italics.

Of all the phases of disturbed metabolism, calcium waste should hold the interest of the dentist; among, the few coming under our notice may be named, the early resorption of the roots of the temporary teeth and their too early loss, and for the same reason, delayed eruption of the permanent teeth (Fig. 10). Also Waller's idea of the ratio of salts excreted by the salivary glands and appearing in the saliva in relation to dental caries; excessive amounts of certain forms of salivary and serumal calculus and that opposite type, the erosion mouth, one of the expressions of the hyperacid diathesis, where no deposits occur in the teeth, but the acid sodium and calcium salts produce cervical tooth destruction and have been proven in the saliva. Erosion has in more than one instance been associated with deficiency of the thyro-para-thyroid apparatus in middle life and after, by the writer *who is also convinced that there are many varieties of wasting and decalcification of tooth structure which are primarily not the work of micro-organisms, though later caries may lodge and grow thereon as it would on mechanical defects.* It must be remembered that the periods of stress, first and second dentition, puberty, pregnancy, the climacteric and senility mentioned in the beginning of the paper, when internal secretion as apt to be disturbed, are also the periods when caries is at its worst, and these also are the periods of defective calcium metabolism. There are also well-authenticated cases of dentinal resorption via the pulp, one of which was reported by the writer (28) which this idea of defective calcic metabolism alone will explain as it does the internal dentinal defects of pregnancy, senility and possibly tuberculosis.

In conclusion, it may be said that the dentist of the present and the future can no longer afford to conjure with such expressions as "auto-intoxication," which sound much and mean little; he must think straight on the newer lines of a pathology, based on a new physiology, which recognizes the internal secretory organs, and while all disease does not arise from defective internal secretion, it has its place in any pathology, and the great problem is to properly locate it.

Description of Illustrations.

Fig. 1. Arrest of development in a sheep after a thyroidectomy done six days after birth; the larger one is the skeleton of a normal sheep of the same age. (Von Eiselsberg.)

Fig. 2. Thyroid extract in cretinism. (J. B. McGee.) (a) Cretinic idiot seven years old when thyroid treatment was begun. Had ceased to develop when three years old. The typical protrusion, thick lips and enlarged tongue, if it could be seen, the "pot belly" and hands and coarse scanty hair.

(b) Changes after one year's treatment. Growth, 8½ inches. The change in the angles of the face and in expression about the mouth, the limbs, abdomen and general development particularly of hair.

Fig. 3. (a) A cretin, twenty-three months old. (b) The same child, thirty-four months old, after administration of sheep's thyroids for eleven months. (c) A cretin, untreated, fifteen years old. (W. Osler.) Note the typic mouth expression in it and compare with cases presenting for orthodontic treatment. In (b) the result of organo-therapy without the help of the orthodontist, finally the profile, enlarged lips and tongue, scanty hair and swayed back, and general mongolian expression in the fifteen-years-old cretin in (c). From *Human Physiology,* Starling.

Fig. 4. Cretinic obesity. Case of cretinism, aged twenty-one. Effect of four months' thyroid treatment. (Sanderson.) From Sajous, *Internal Secretion and Principles of Medicine, Vol. I.*

Fig. 5. Peter Krantz. From Deutsche Zahnheilkunde, 1914. (a) Mandible of normal dog. (b) Mandible of a dog after losing its hypophysis.

Fig. 6. Peter Krantz. From *Deutsche Zahnheilkunde, 1914.* (a) Microphotograph of a section of a normal dog's tooth (the control from the litter), showing size of pulp chamber and tooth and type of dentin.

(b) Microphotograph—under the same conditions—of a section of a tooth of a dog (same litter) from which the pituitary (hypophysis) had been removed.

Note the reduction in size of the diameter of tooth and the great increase in the pulp chamber, showing a control of the pulp function and dentin formation.

Fig. 7. A. Note photophobia; spacing of teeth; full œdematous hand; and characteristic acromegalic profile.

B. Patient at twenty-five, before onset of the malady, constrasted with present condition.

From Cushing: *"The Pituitary Body and Its Disorders."* "Hyperpituitarism of eight years' duration with outspoken acromegaly."

Fig. 8. Note (left) spacing of teeth; strabismus; adiposity; (right) profile with maxillary rather than mandibular prognathism.

From Cushing: *"The Pituitary Body and Its Disorders."* An Extensive hypophysial struma with dyspituitarism evidences of former activity shown by slight acromegalic changes.

Note: Cushing repeatedly calls attention to maxillary as well as mandibular protrusion with spacing of the anterior teeth in both jaws caused by pituitary disease.

Fig. 9. Barbara Poehl, born April 6, 1856, in Martinsheim, died Jan. 23, 1887, thirty-one years of age. Could neither walk, stand nor eat

without aid, and her body looked as though it belonged to a two-year-old child, whereas the head was the size usually found in grown-up persons. The superior maxilla seems fairly normal, with the exception of some slight malpositions of some of the teeth, whereas the mandible or inferior maxilla shows nineteen teeth, the entire right side and the incisors upon the left side being double.

Peter Krantz. From a reprint from the *Deutsche Monatsschrift fur Zahnheilkunde, 1912.*

Your attention is called to the results of defective calcium metabolism shown in the retention of the first dentition (Abb. 19a), the prognathism (Abb. 19c), the width of the arch in the molar region (Abb. 19b), yet the crowding of the incisors in the premaxilla (Abb. 19b).

Fig. 10. Anna Volk, thirty-year-old cretin, died in the Maternity Hospital at Grazer, from eclampsia, on the 6th day of December, 1877. Cretinous skeleton No. 3235; shape of the head oval, superior maxilla asymmetrical, the alveolar process upon the left side reaching more deeply. Occlusion fairly well preserved. Open bite. The teeth are separated to the extent of from two to three millimeters each. Upper incisors are ridged or grooved. Peter Krantz. From a reprint from the *Deutsche Monatsschrift fur Zahnheilkunde, 1912.*

Note the protrusion and spacing of the incisor groups associated with enamel hypoplasia labial central incisors.

Fig. 11. Katharina Temmel, seventeen years old, single, a cretin. Born in Grafendorf near Steinz. Died Dec. 22, 1881, in the General Hospital at Graz. Skull No. 3663.

Peter Krantz. From a reprint from the *Deutsche Monatsschrift fur Zahnheilkunde, 1912.*

Note the premaxillary protrusion and compare it with adult malocclusion said to be from other causes. Enamel hypoplasia well marked on all teeth.

Fig. 12. Ferdinand Stock, from Hirschfeld, died July 1, 1902, at the age of twenty-five years. He was a typical cretin. At the autopsy, no thyroid was found. The skeleton was one hundred and four centimeters long. Skull was medium size. Only a few teeth were preserved and they presented typical rachitic grooving, etc. Cuspids mark prognathism.

Peter Krantz. From a reprint from the *Deutsche Monatsschrift fur Zahnheilkunde, 1912.*

Fig. 13. Female cretin, name unknown and age unknown. Died the year of 1870, General Hospital at Graz, of gangrenous endometritis. Skull No. 1631. Round skull with evident prominence of the distal part of the face. Lower part of the face slightly prominent. Superior maxilla

extends over inferior. Teeth preserved. The upper incisors show distinct undulating grooves.

Peter Krantz. From a reprint from the *Deutsche Monatsschrift fur Zahnheilkunde, 1912.* Note the well-defined enamel hypoplasia, incisor and canine groups.

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Discussion on the Paper of Dr. Grieves.

Dr. Herbert A. Pullen, Buffalo.

I consider it a great privilege to open the discussion on such a comprehensive scientific paper as has been offered by the essayist, even though I am unable to present a scientific discussion of the subject matter. At least, I can express my appreciation of the value and importance of this paper to our society, and our deep obligation to the author for its elaborate composition and presentation.

I had long contended that the success of our treatment in orthodontia is based primarily on our understanding of the etiological factors involved in arrested or perverted development in the dental arches. The successful use of vaccines in medicine owes its inception to what was called the germ theory, and by the isolation of the particular bacterium causing such a disease as diphtheria; the later discovery and production of a preventive antitoxin refers directly back to the etiological factors involved.

In our reiteration and investigation of etiological factors in malocclusion we have stumbled upon the idea that these conditions were but local symptoms of deeper seated pathological disturbances none too soon, not to be taken too much by surprise by these newer etiological factors included in the essay.

Malocclusion itself we really recognize as a symptom of a deeper pathological disturbance than lack of occlusal function.

Normal occlusion is an impossibility unless the internal secretory organs are synchronizing all of the time during growth of the internal and external face, if we accept the theory of the extent of their influence. Normal occlusion is located on a mechanical function controlled absolutely by the growth-controlling forces of these ductless glands, and is a terminal function largely, although correlated through use and misuse, with growth or lack of it in the internal face.

I am exceedingly glad to have a theory on etiology presented which will conform to or link harmoniously with the orthodontist's idea of arrested or deficient development associated with or preceding occlusion of the teeth.

If we can accept the essayist's conclusions that the lack of breast feeding of infants and the lack of human activation in cows' milk predisposes to arrest of development of the dental arches and to consequent malocclusion, then we may sometime be forced to begin early treatment of malocclusion at the time of childbirth, so to speak, by supplying the activators or other nutritive elements necessary for normal growth of the infant. Perhaps the future orthodontist will succeed to the physician's mantle, carry activator tablets, calcic salts, and developmental powders; and make house to house calls, dispensing normal occlusion in triturated tablets.

I think this splendid paper furnishes the most conclusive evidence of the deeply rooted relation that orthodontia bears to general medicine and of the necessity for the teachings of more than the fundamentals in medicine to the future student of orthodontia.

How many of us ever dreamed that the physiological chemistry of college days which we passed by as a non-essential in the study of dentistry would one day hold first place in the laboratory research work in the search for causes of malocclusion. Did we ever dream that the once unknown internal secretory organs which we at one time thought too insignificant to study would one day array themselves in sequence and synichronism as organs absolutely necessary to life and controlling bodily growth, nutrition and metabolism?

If the comprehensive fabric of etiological material which the essayist has presented can be made to hold together as a plausible theory, even with only an occasional demonstrable fact, our own efforts at etiological investigation will appear but dim scratches on the surface of a vast fund of knowledge which appears to be unfolding before us.

Let us at once be imbued with the idea that the cycle of synchronism of the internal secretory organs is seriously impaired by the infectious diseases of childhood, such as scarlet fever, measles, chicken-pox, whooping cough, etc., and we will make greater efforts at isolation and prevention of these diseases. If by these studies of the internal secretory organs a correlation between the development of the dental and maxillary arches and the stimulation of the pituitary body to normal functioning is proven to exist, our own rather crudely expressed and unsupported theories regarding the influence of orthodontic treatment upon these growth-controlling organs will have been established on a more elaborate foundation of fact.

As Cushing says, "There are few subjects in medicine which promise a wider overlap upon the fields of many special workers than this one of hypophyseal or pituitary disease. From the direct implication of the optic nerves by the glandular enlargement, the ophthalmologist has often been the first to recognize these maladies. The neurologist's interest was early aroused through the pressure disturbances on the part of the encephalon, and will be reawakened in view of the possible relations of epilepsy to glandular insufficiency.

"Specialists, whose activities are as divergent as are those of the actinographer and the physiological chemist, are now called upon, not only to aid in the matter of diagnosis, but it lies in their province to add materially to our further knowledge of the subject. And, needless to say, to the operating specialist in nose and throat maladies the subject is of prime importance, not only because the hypophysis itself abuts on his preserves, but for the special reason that there exists a pharyngeal organ which may possibly be a not infrequent seat of disease and which may possess some physiological properties of importance to the organism."

The essayist has struck the keynote in the relation of these various internal secretions to developmental conditions when he says: "The significance of all of the foregoing (referring to all of the ductless glands, their secretions and pathological effects in disease) to the dentist is that he should differentiate acromegaly, from mandibular protrusion from other causes, and be able to recognize the tipping forward of the anterior teeth and increase in the dental spaces, and the orthodontist should bear in mind, no matter what his theory, from the numerous cases showing improvement in the pituitary syndrome, that it may yet be possible to relieve some of the symptoms by spreading the arches, possibly by drainage of the ethmoidal and sphenoidal sinuses, relief of lymph blocking or of the circulation, etc. In other words, the dentist and the orthodontist must enlarge the scope of their vision as to etiological factors and their internal and external pathological expression. Otherwise we are treating symptoms alone without the knowledge of the causative factors, which point the way even indirectly to the more scientific treatment of malocclusion.

Bottle Feeding; Organotherapy.

We must recognize our limitations in diagnosis and treatment and call in the trained specialist in other lines to assist us in diagnosis from a consideration of all of the etiological factors involved. If organotherapy will some time be depended on to stimulate normal function of the internal secretory organs and secondarily function and growth of the dental arches and internal sinuses; if bottle feeding is so serious a matter in its lack of supply of activators to development of the ductless glands, then it is up to the orthodontist to fall in line with the theory and at least understand the therapy of supplying artificial activators, so as to be able to give intelligent advice to parents.

As to organotherapy, in all probability after it has been experimented with until its possibilities are better known, it will be of assistance in constitutional treatment during the treatment of malocclusion.

The extent of the various phases of internal secretion, and the voluminosity of the subject matter of the paper in all its relation to orthodontia are so great that again I must regret that it has been impossible for me to have read one-tenth of the authorities mentioned in the text since receiving the paper, and even if I had I would still be unable to discuss scientifically this contribution as I should like to do.

I shall be interested in a further study of the paper, as I feel that it is one of the most valuable ever presented to this society.

Dr. C. A. Hawley, Washington, D. C.

I think most of us who have listened to this paper by Dr. Grieves are reminded how he covered the subject of the therapeutic action of metals some years ago when he won honorary membership in this society. You will remember how well he investigated that subject and how his results have practically never been questioned since.

He has clearly and exhaustively presented a tentative hypothesis for the explanation of some of the etiological problems we have encountered in malocclusion. I am sure that a common orthodontist like myself could not be expected to go into the details of this hyphothesis in a critical way. The value that we shall realize in the presentation of this paper is to see how nearly his hypothesis squares to the facts of treatment retention as we see them in every-day practice. While some years ago we considered adenoids and diseased tonsils as causes of malocclusion, I think practically all men of experience have come to regard them as simply associated conditions. If we go on further we unconsciously realize that there is some condition back of the adenoids, and that Dr. Grieves has probably presented in his paper the true nature of those conditions.

Again, his hypothesis agrees with our prognosis. It explains why in so many cases we do not get complete success. There is that lack of tone in the bone which interferes with the final establishment of proper function. To verify this hypothesis we naturally and properly go back to the conditions existing among primitive people, and he suggested to me when he asked me to discuss his paper that I consider that phase of the subject.

Deduction from Examination of Sculls.

In the National Museum at Washington there are something like 300 skulls of children under twelve. It is quite a remarkable collection, probably the best in the world. While we find thousands of skulls in the museums, it is difficult to find those of children, and these have all been collected and kept together. They consist of the skulls of Indians, Mexicans and Esquimaux. In examining these skulls, I collected first those under five years of age. I found in the number I examined (about eighty) that there were seventeen under six years of age. If we consider the question as to how much these children were underdeveloped at that age, and the only standard of development we have is the Bonwill arch, corrected to correspond with the size of the teeth; if we take, not the extreme that we see in our human dentition, but the average, we find that the width across the second deciduous molars from what we call the occlusal line, that is, passing through the crest of the buccal cusps of the second molars, there is a variation of from forty-five to fifty millimeters. That is what would be the normal average. Of these seventeen, the average Indian child measured forty-five millimeters. You see there is something under normal there, but not greatly so; probably from two to three millimeters under what could be called normal. I went through the cases in my own cabinet and found models of eleven cases of children under five. These average thirty-eight millimeters. While the Indian child is slightly under normal at this age, our American child is greatly so, that is, from seen to eight millimeters under normal.

I found there fifty-one cases of children six years of age and eleven or twelve, and these were practically all normal; that is, the average width across the occlusal line in the region of the first permanent molar is from fifty-one to fifty-five millimeters, and the average in these fifty-one cases of Indian children was fifty-two and one-half. We can say they were practically all normal. With the variation that you would expect from the size of the teeth and the type of the individual, possibly they were exactly normal.

Taking thirty cases from my own collection of white children I found an average of forty-seven millimeters, about five and a half millimeters less than in the average Indian child. To corroborate Dr. Hrdlicka's observations and those of the essayist, all of our white children are under normal. The statement has been made constantly that our white children present the picture of arrested growth. There is not what we would expect, namely, a natural growth from a child of four or five to nine or ten. In the Indian children there seems to be a greater growth up to the age of four or five than in the white children, and from that time on, after the eruption of the first molars, while the white child stands still, the Indian child grows and becomes normal. He grows up to what we call a normal arch. There is no evidence whatever in these skulls of malocclusion, or of adenoids or protruded teeth. There are none of these types. They are somewhat difficult to judge, because in almost every case the incisal teeth are lost on account of the conical roots.

A Member. I would like to ask Dr. Hawley whether he has made any investigation of negroes. In my State there are more of them than there are in New York and other places. I would like to ask him whether he has ever examined the skulls of negro children?

Dr. Hawley. Not accurately at all. I have observed a good many, but have not made critical examinations. The modern negro, so far as casual observations go, is almost in the condition of the white child. I asked the Dean of the colored dental school in Washington as to his clinical work in orthodontia and the condition the colored children presented, and he said they are beginning to find as much malocclusion in the negro children as in the white; but where they go back to the primitive negro there is very little malocclusion.

Dr. Ottolengui. There is less malocclusion in the negro of the South than in the negro of the North?

Dr. Hawley. Very much so.

Dr. Grieves. Dr. Hrdlicka says the negro is almost generally rachitic, that is, he has rickets in some form. Of course, that would affect his occlusion.

Dr. Hawley. The negro in modern civilization presents a very different picture from the negro back two generations. He is afflicted with disease and decay of the teeth and malocclusion, yet there is evidence of normal primitive conditions.

In discussing this subject with Dr. Hrdlicka I find that he is very emphatic in his opinion as to the value of breast feeding in Indian children. Also, the Indian child is given as soon as he wants it any hard food. He is given green apples and other hard food. Anything the child wants to chew he chews. It does not seem to hurt him. If we should give a white child green apples, or anything it wants to chew, we would expect it to die. The Indian child does not die from eating such food. If we would take the evidence presented it would almost corroborate Dr. Grieves' opinion that there is, in the first place, a greater activation of growth in the skull up to four or five years of age. Then we come to the function of the teeth, and the Indian child at an early age subjects the teeth to severe use. You find all the temporary molars with the cusps worn off, and some of them worn half way down to the sockets, showing the severe use to which they had been subjected. It seems to me, we are going to get a new hold on this proposition, and probably we may finally have some suggestions to make in regard to the diet of children that will be extremely valuable.

Dr. C. H. Juvet, Ottawa, Ontario. I do not presume to rise to discuss this very carefully prepared scientific paper, but I would like to ask for some information. The diagnosis of some of the cases cited by Dr. Grieves is more than I can understand, and in this connection I want to relate briefly a case.

A year or so ago there was brought into my office a patient presenting normal occlusion on the left side, but on the right side the teeth were fully one-half inch apart. From a superficial examination from the facial expression I came to the conclusion that the ramus on the right side was much longer than the ramus on the left side. I could find no evidence of early dislocation or of fracture. I advised that an X-ray be taken, and I have skiagraphs of the condition. I would like to ask Dr. Grieves his opinion as to whether he thinks the pituitary body frequently has an influence over these conditions in causing a slow development of bone tissue. There has been over-development of bone tissue in the ramus of the right side, and I understood him to say that on removal of the pituitary body there follows a diminution of bone tissue.

Dr. Grieves. That is what somebody else said.

Dr. Juvet. The information I wanted to get is this: Have you ever had, Dr. Grieves, a case of a similar nature under observation, and have you had the opportunity of perceiving the effect of the removal of the pituitary body, and if so, to what extent did you get a diminution of bone tissue beyond the normal from the removal of the pituitary body?

Dr. Grieves. That is just the reason for writing this paper. I do not know, and we must all make observations. The condition in your case was asymmetrical. Those I have seen have been symmetrical. I have seen but one case that has reduced. Operations on the pituitary body are comparatively rare. I have seen one case that has been reduced somewhat, but I have not seen any returns such as described by the different authorities. In those I have seen the mandible was symmetrical. There was apparently growth of the alveolar bone with symmetrical growth of the malar region and mandible, not asymmetrical, as in your case.

Dr. Ottolengui. Do I understand that we are to gather the idea from what you have said that this overgrowth, although symmetrical, will be confined to the mandible? If there is overgrowth traceable to some influence of the pituitary body, is it always confined to the mandible or may it involve the maxillary bone?

Dr. Grieves. I mentioned the mandible and the malar region.

Dr. Ottolengui. Would it also involve the maxillary bones in some cases?

Dr. Grieves. It might involve one bone and not the other. It is not explainable.

Dr. Ottolengui. If it is not explainable, it is not much of an hypothesis. What I mean is this: I have been looking at this subject from a logical standpoint, and I find it difficult to understand why the influence of the pituitary body would cause overgrowth of the mandible and not affect the maxillary bones at the same time. In these acromegaly cases we see the influence extending elsewhere besides the mandible, as in the first picture thrown on the screen by Dr. Grieves, where there is undoubtedly an increase in growth in the forehead, and the hands also have increased in growth. It is hard to believe that this pituitary influence can be confined to such an isolated locality as the mandible alone.

Dr. F. C. Kemple, New York City. When Dr. Grieves writes a paper it is usually one of importance and interest to the profession, and the present essay is no exception in this respect. The subject of "Internal Secretions" is one of profound importance and interest to both the medical and dental professions, and in handling this subject the essayist is dealing with one which offers a broad and almost virgin field for research, the surface of which has not even been delicately scratched.

A short time ago a paper was read at Albany before the New York State Dental Society on the subject of internal secretions. One of the members of the Program Committee, in casting about to find some person who could intelligently discuss such a paper, called up on the telephone a prominent physician in New York City and asked him if he could suggest some one. The physician thought for a moment, and then, calling this member of the committee by name, said, "Well, Bill, none of them really know a blank thing about this subject, so it doesn't make much difference who you get to discuss it." (Laughter.)

As I listened to the essayist it struck me that one of the chief thoughts running through his paper is that the internal secretions exercise a very important influence over the development, not only of the maxilla and mandible, but of all parts of the body, affecting particularly the osseous structures. Also the essayist has cautioned against accepting any positive statement concerning just how these secretions influence the process of growth, or just why they do it. About all that we know at the present time concerning them is, that they are not the useless, functionless organs that they were at one time supposed to be; that they play an important part in balancing the metabolism of the organism, and now it is up to the physiologist to find out how they play this part, and in what manner their action can be controlled.

This subject offers a valuable and fertile field for research, and I believe the essayist intends this paper to be more as an introduction to a study of the subject than an attempt to deal with it exhaustively.

Dr. Grieves. A protocol only.

Dr. Kemple. Yes, a preliminary to the study of the possible relation that internal secretions may have to malocclusion. He is not making any positive statements; he has simply collected and presented his data to this society as a contribution to the study of the subject, and to stimulate an interest and further study by members of this society. But it would be well to emphasize the caution which he has expressed, *i. e.*, not to accept these statements as either positive or final. It is all too soon for anyone to say that this condition or that condition is caused by pressure on the anterior left lobe of the pituitary body, or by a pathological state of the hypophysis, or of some other part of this poor little body. One may think it, but does he know it?

In regard to the Indian children: A few years ago, while up in Canada, I had an opportunity, through the courtesy of one of their Indian agents, to examine the mouths of a large number of Indian school children between the ages of six and fourteen years. It happened to be holiday time, but this gentleman called a meeting of these children at the school house and we had a regular examination. I spent several hours in studying their mouths, and in making the examination I measured the arches according to the Hawley charts. I found them all, without any exception, to be well developed arches, practically normal in width. Also, there was practically normal occlusion in all of them except where approximal contact had been destroyed by caries, or teeth had been prematurely lost and adjoining teeth had drifted into the space.

Dr. Grieves (Closing). Our internal secretions are very much disturbed, no doubt, by the first point Dr. Kemple made, although I will say the quotation was taken from Dr. Tandler. He made the remark that the effect on the jaw might be from syphilis in the mother affecting the child in utero; that is, the effect of the syphilitic mother on the bones of the child. He also mentioned rickets. Disagreeing with my friend, Dr. Kemple, I believe there are many assured facts in this work, and this work is going on rapidly. I think there are assured facts when Dr. Mayo will perform 1,500 thyroidectomies to relieve goiterous conditions. There are certain hypotheses which have been proven on which surgeons are working. There is no reason why we should not work on the same hypotheses as far as they have gone.

Dr. Kemple. My statement is that I do not believe there are any facts already obtained that have a direct bearing on malocclusion at the present time.

Dr. Grieves. My hope in bringing this paper before you was to assemble the facts known to-day in relation to the possibilities in orthodontia.

It would be nice if the members of this society could make such pilgrimages as are made by some societies in going from museum to museum and studying the conditions in these museums, such as the Society of Americanists, for instance. It would pay us to make a pilgrimage to these points and see the large numbers of specimens, just as it would pay us to visit the National Museum to look over the eleven thousand skulls there. I came here for information and to present data for your benefit in regard to orthodontia. We are going to try to do a little more, and I hope that you will take it seriously enough to go home and associate yourselves with pediatricians and internists and get them interested, and the best way to get them interested I have found is to be very conservative. I have a few children on lactate of calcium, barring the use of thyroids, since the first of the year, and have had interesting results. I am not thinking of the old scheme of feeding lime, but of the lactate of calcium as a possible activator of the glands with internal secretions. I wish you would notice children who have enamel hyperplasias, who lose their temporary teeth very early and then are slow in erupting the permanent teeth. I would suggest the use of lactate of calcium in such cases, and it can be given quite freely in these conditions.

I thank you very much for your attention.

A New Method of Attachment for the Loop Arch.

By Ray D. Robinson, D.D.S., Los Angeles.

From the time of the use of the metallic arch by Fauchard down to the present, a variety of methods have been utilized to secure attachment of individual teeth to the arch, and for the application of force for various purposes. The original arch of Fauchard was merely a form to which the teeth were brought by the immediate force applied with forceps, or by the gradual shrinkage of the various kinds of contractile ligatures, such as cotton and silk thread. Then came the elastic metal arch by Patrick, Farrar and Angle. The anchorage bands were also largely the result of the work of Angle, Lukens, Barnes, Kemple and others.

A variety of tooth movements by various methods and authors is also of historic interest and might be of value to consider had we here the time to discuss them in their various relations.

The screw force as developed by Farrar, the elastic arch of Patrick, the steel tempered wire fingers and loops by Jackson, the elastic rubber bands of Case and Baker are well-known methods which have in their various times and several ways done much to make modern orthodontia a scientific art.

The author's experience with the Angle arch, with its system of wire ligatures, has frequently caused him and his patients so much worry and anxiety that he longed for a simpler and less troublesome method of applying the arch, and also for the development of a force which while constant would be under such complete control that it would be more easily tolerated by patients.

More recently the so-called Angle attachment of tube and pin with the three-piece arch was a decided advance over the former one-piece arch with ligature attachments, but its construction and adaptation require such exact adjustment that but few men have the technical skill to apply it to the best advantage for securing desired alignment of the teeth, and it leaves much to be desired in those cases where great expansion is needed. This latter objection, however, in large measure, should be overcome by the looped arch suggested by Dr. J. Lowe Young. I have, however, to confess that I have not seen Dr. Young's adaptation nor have I any personal acquaintance with his particular invention.

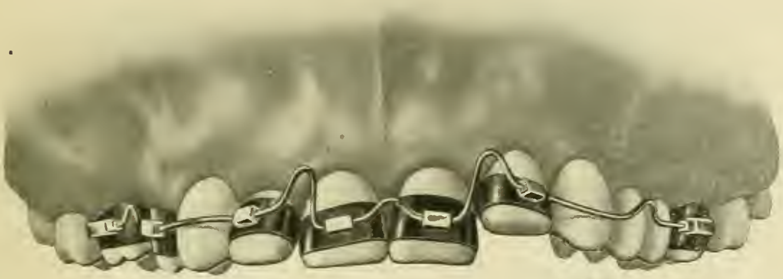


Fig. 1.

The appliance which I have to present for your consideration is a loop arch attached to the teeth by a series of definitely formed angular blocks, soldered to the arch and resting securely but not immovably in corresponding seats which are soldered to the bands on the teeth.

The idea in designing this appliance has been to secure all the needed tooth movements by a single appliance that is easily adjusted and that will not require frequent inspection nor continued surveillance, exerting at all times a delicate and positive force rather than inducing a severe force intermittently applied.

The following description of the apparatus is abstracted from an article contributed to the June, 1914, Items of Interest:

"The appliance consists of a delicate spring arch (Fig. 1), bent to conform to the individual dental arch to which it is to be applied, with loops extending toward the root or toward the occlusal end, as may be found convenient, placed in advantageous position; and an attachment consisting of a seat (Fig. 2) soldered to a plain band on the tooth and a square hollow block of metal, the outside measurement of which is the same as the inside of the seat, and the bore of which is equal to the diameter of the arch wire (Fig. 3).

"The seat has a flat base and parallel walls extending at right angles to the base, the walls being fifty per cent. higher than the width of the base, which allows sufficient material to bend over the fourth side of the block, thus enclosing it in a square tube which it accurately fits (Fig. 4).

"In constructing and applying this apparatus, the bands with seats attached are first made and cemented to the teeth, using a form of anchor band."

At this point I wish to deviate from the published article and describe a form of anchor band devised since the article from which I have been quoting was written. This anchor band is a modification of the Lukens' band. The modification consists of making the tube post with a square socket extending approximately one-half its length from the screw end, leaving the square end of solid metal; and a locking device which will lock the post on any quarter turn. The locking device consists of two holes drilled at right angles with each other through the solid portion of the tube post in a position which will bring them under the metal collar on the band and two holes drilled through the collar in alignment with each other in such a position that they will come opposite the holes drilled through the post. This permits the tube posts to be locked by a delicate pin on any quarter turn, thus assuring an absolutely rigid attachment to the anchor tooth, and also assuring a bodily movement of the anchor tooth if it is desired. This form of anchor band, having been placed on the anchor teeth, I will now return and read from the article published.

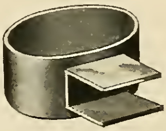


Fig. 2.

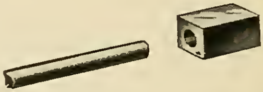


Fig. 3.

Fig. 4.

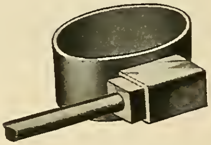


Fig. 5.

"The requisite number of blocks being placed loosely on the arch wire, a long block (Fig. 5) is soldered to one end of the arch, which is then put into place in the square socket in the anchor band and the arch bent in such a way as to bring it into the adjacent seat, a loop being formed if desired One of the blocks is now brought to the proper place on the arch wire to engage in the seat. The arch is then taken from the mouth and the block soldered. The arch is again placed in the mouth and again bent to bring it into alignment with the next seat, it being understood that loops are formed between such seats as is deemed necessary for the development of force and for the directing of the movement of the teeth. This operation is continued until all the teeth requiring movement have been engaged, when another long block is soldered to the other end of the arch to engage in the other anchor band.

"After polishing, the arch is next put into place and the extensions of the walls of the seats are bent over the four sides of the blocks (Fig. 4).

"It will be readily seen that the attachment between the arch and the tooth is absolutely rigid, and any movement of the arch wire will in time be registered in the tooth.

"In that form of appliance, having tubes soldered to the bands parallel to the long axes of the teeth and posts soldered at right angles to the arch to engage in these tubes, such absolute accuracy of adjustment in soldering is necessary as to make the appliance efficient only in the hands of the skillful technician. It must also be appreciated that as the planes of the post and arch are at right angles to each other, any inaccuracy in alignment will be magnified in the tooth movement, whereas with this appliance and its accurately fitting blocks, inaccuracy in construction and adjustment are practically impossible. The long axes of the arch wire and the block, which is to be soldered to it, not only lie in the same plane, but the arch wire actually passes through the centre of the block, eliminating all possibility of error in alignment.

"As the block can both rotate and slide on the arch wire, it is easy to place it in the exact position required by forcing it into the seat. Once it is in its proper place, it is pinched slightly with pliers to prevent its becoming misplaced while being carried to the flame for soldering. Thus it will be seen that it will require the grossest carelessness to make an error in transverse alignment.

"There should be no trouble in bending the arch wire into the desired form. The wire commonly used is 24-gauge B. & S., and very frequently 26-gauge wire will be sufficiently heavy. As the first block is soldered before any bending is necessary, and as it holds one end of the wire rigidly in its proper position, and as the bending can be done in the mouth, the writer can see no reason for either error or difficulty in bending the arch, even by those of average ability.

Tooth Movement.

"A little study of this appliance should convince the most skeptical of its efficiency. It will be seen that by springing a loop open, force will be brought to bear on the teeth adjacent to that loop. As, for instance, opening the loop in the incisor region will exert force in the direction necessary to widen the arch as far as the cuspids. If it be found necessary to carry the incisors labially, the loops in the cuspid, bicuspid and molar regions will be sprung open. If it be found necessary to carry the incisors on one side mesially, and those on the other side distally, without carrying them labially, as frequently happens, through the premature loss of one of the deciduous cuspids, it can readily be done by opening a loop placed over the cuspid region where the space is to be made and closing one over the opposite cuspid region. If found necessary to widen the arch in the bicuspid and molar region without widening the incisor and cuspid region, it can be accomplished by slightly opening the seats on the incisors, allowing the blocks to slide distally through the seats and then opening the loops in the incisor region. It will be readily seen that the force generated by opening these loops will be exerted in the desired direction and place.

"If a movement tending to throw the apex of the root buccally or labially is desired, it can be secured either by bending the adjacent loops in the desired direction or by taking the arch from the mouth, heating the block, and while hot turning it in the desired direction. When again placed in the mouth, it will be found necessary to spring this block to place. When the edges of the seat have again been bent over the block, it will exert force that will cause the apex to move in the desired direction. If it be found necessary to move the apex mesially or distally without disturbing the relative position of the crown, it can be accomplished by bending the adjacent loops in the directions indicated. It will readily be seen that more than one of these movements can be accomplished at the same time. In fact, any desired movement of the teeth can be accomplished without disturbing other teeth which may be in their proper places. The reasons for this are: That the attachment between the tooth and arch wire is absolutely rigid, and second, the force necessary to the tooth movement is generated at the point where it is to be applied.

"The force being that of a spring and generated from small, delicate wire loops is not violent in its action, but slow and delicate, although none the less positive. Being of this character, the result resembles a physiologic rather than a pathologic action, causing the minimum of pain and requiring a shorter period of retention.

"The force is more directly applied, is longer continued, is more easily controlled and causes less annoyance than that generated by any other appliance with which the writer has had experience.

"It is obvious that a triangular block, or any angular or oval or round block, with a pin raised on one side, placed in appropriate shaped seats, would accomplish the same results. It is also obvious that the converse of this is true, that is, the same result would be accomplished by placing the seat on the arch wire and the block on the band.

"The attachments could readily be used on the old form of arch, depending on screw force, but the writer finds the force generated by opening the loops to be of such a character as to produce better results with less annoyance."

Since writing the article from which I have just been quoting, I have found a different form of block to be easier to handle than the square one. This form consists of a flat base and parallel walls extending at right angles to the base for about half their length and then converging to a point opposite the centre of the base. This form gives absolute rigidity and requires that the seats walls shall be bent at a less acute angle, making the appliance easier to handle on account of the ease with which the seats may be repeatedly opened and closed and assuring a longer life to the seat.

Realizing that on first inspection of this appliance your principle objection would be that the seats are liable to fracture under repeated opening and closing, I will show three forms of seats that will lock the block securely into place without the bending of any metal. Each of these forms is efficient, but the writer has experienced so little difficulty through breaking of the seats, and he finds that locking the block by bending the seat walls is so much simpler that he prefers this method to any other.

The advantages of this appliance as they have appeared during the more than two years of its development into its present form may be summarized as follows:

Advantages of the Method.

First: A more perfect control of tooth movements. All the different tooth movements are easily and comfortably accomplished with definiteness and saving of time for all ages and patients that are amenable to treat with any other appliance.

Second: Freedom from ligature troubles. Because of the design there can never be irritated or diseased gums, cheeks, lips or tongue from obtrusive projections, and every facility for cleanliness is secured. All attachments in the form of bands are accurately fitted and cemented to the teeth, so that no part of the metallic appliance comes in actual contact with the tooth tissues, thus precluding the possibility of erosion of the teeth even though the treatment be unusually prolonged. The arch can be so formed and adapted that at all times it should lie close to the teeth, obviating serious objections to many forms of appliances formerly used.

Third: Facility for changing form and making repairs. The seats may be readily opened and the arch released when occasion requires such a procedure. In fact, the entire arch can be removed for soldering into place a new block or to change the position of a block, or to repair a broken seat or band. The seats are capable of being opened and closed many times without impairing the integrity of the metal. Thus it will be seen that the appliance is amenable to such repairs as are customary with all other appliances, and with equal facility.

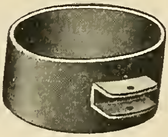


Fig. 6.

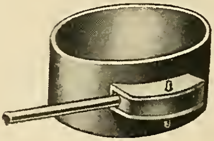


Fig. 8.

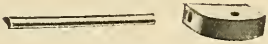


Fig. 7.

Fig. 9.

Fourth: Retention. Teeth moved with this appliance are less difficult to retain because the movements are less violent than with some appliances. Under this treatment absorption and tissue rebuilding take place in a more nearly physiologic manner because of the nature of the force applied. However far such a tooth may be moved, it is at all times supported and protected from shocks that would retard new tissue development. Consequently, when the movement is concluded the retention period should be much shorter than when the teeth are moved by the intermittent forces. In fact, the writer finds that the moving appliance makes an excellent retention appliance. This is accomplished by opening all the seats when the movement is concluded, and the loosened arch is so bent that each block will be dropped back into its corresponding seat and lie passive; the seats are then closed and the teeth remain at rest.

During the development of the appliance, the writer first used a square wire for the arch; he then tried a triangular wire and afterwards a flat wire, with appropriately shaped seats and locking device for each form of wire. These forms proved about equally efficient, but all had the common fault of producing a completed arch of unequal expansive force when loops were put into the wire, owing to the sharp angles produced when the arch was bent. This was due to the fact that equal resistance is not obtained when, for instance, a flat wire is bent in the direction of one of its flat sides one time and in the direction of the edge the next time. Still greater uncertainty is encountered in bending a square wire in any angle between the flat side and the corner. In using these angular wire arches it was not necessary to solder blocks to the arch, as the arch wire could at any place be locked securely into the seat. The advantage of being able to put in loops at any angle without producing unequal elasticity so far outweighs the small disadvantage of soldering the blocks onto the round wire that there is now no question in the writer's mind as to the superior merits of the round wire for the arches.

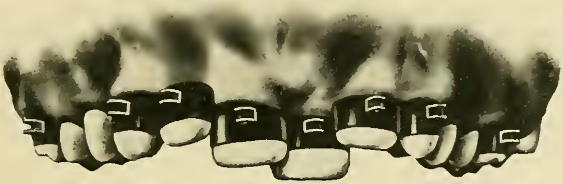


Fig. 10.

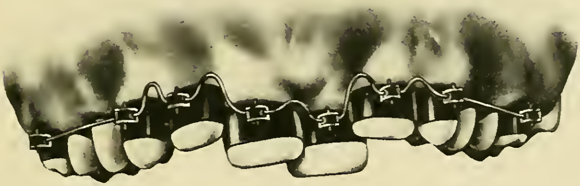


Fig. 11.

Another advantage of the appliance is that when it is once adjusted with bands cemented and the arch locked into place in the seats, it is so firmly fixed that the patient has no power to disturb it or to interfere with its operation. It can be so delicately adjusted that the patient has no desire after a few days to interfere with it in any way.

What the writer believes he has a right to claim is originality in discovering a form of attachment which effectively supplants all former wire and ligature methods with a more easily adjustable and more secure attachment, which he also believes has distinct advantages over the tube and post attachments.

If a delicate but positive force under perfect control, which can be applied over a long period of time without attention, is desirable, the loop arch will give it. If a rigid attachment that will insure absolute bodily control of the tooth, and one that can be applied or released at will quickly is desirable, then the seat and block attachments meet these requirements.

October 1, 1915.

Since preparing this paper, some sixteen months ago, the writer has modified the form of lock as illustrated in Figs. 6-9. The seat (Fig. 6) consists of a flat oblong base and two flat parallel walls rising at right angles to the base. The walls are rounded at the top and each is pierced near the top with a small hole, the two holes being in alignment. The seat is made of platinum-gold and is .022″ thick. The distance between the walls or across the base of the seat is .040″.

The block (Fig. 7) is of platinum-gold, but harder than the seat, and is .040″ thick and shaped to fit inside the walls of the seat above described, except that it is .005″ greater in elevation than the side walls of the seat, which provides means for its being forced into the seat with a pair of pliers, when there is stress on the arch wire to which it is soldered. The block (Fig. 7) is pierced by two holes; the larger runs longitudinally and its bore is equal to the diameter of the arch wire used, or .020″. The smaller hole is through the transverse diameter of the block near the top and is in the exact place to be brought into alignment with the two holes in the seat walls when the block is forced into place in the seat. The block is locked into the seat by placing a delicate pin through the seat walls and the block (Fig. 8). When so locked, no play is possible. The two parts are made to fit to the minutest fraction of an inch, and as they have three flat walls in apposition, and are tightly locked together, they do not permit of any play whatever. The molar and anterior attachments are alike, except that the molars are the longer (Fig. 9).

Fig. 10 illustrates a case in which all the bands, with seats attached, have been cemented into place ready for the arch.

Fig. 11 illustrates the same case after the arch, with the blocks attached, have been locked into place.

This form of lock has overcome any liability the older form may have had to work loose under stress of mastication.

Discussion of Dr. Robinson's Paper.

Dr. Waldron. I cannot say very much for or against this type of appliance as recommended by Dr. Robinson, because I have not been using it for more than seven or eight weeks, but I am, however, trying it out on two cases. I cannot agree with Dr. Robinson that it is so simple in its construction, but possibly familiarity will overcome this difficulty.

In making the bands for the incisors I should recommend that they be carried under the gingival margin on the labial surface of the teeth, as advised by Dr. Young in his description of banding teeth for the new Angle appliance. This would lessen the susceptibility of caries, inasmuch as the tooth would be protected from the influence of putrefactive matter which would lay from time to time between the loops in the expansion arch and the teeth.

As far as the efficient control of this appliance, I am not in a position to state with my short experience with it, but I think the operator would have to familiarize himself with the dynamics of this arch, for bending the loop in one direction will exert an equal force in the opposite direction. Therefore, you must have your resistance always greater than the force to be moved, and to do this, as I have stated before, requires a greater knowledge of the dynamics of this arch than I possess at present. I have been amazed at the amount of expansion accomplished by this delicate appliance, and also that there has been no sign of tenderness since the appliance was put on.

The base wire which I used was twenty-four gauge, of gold and platinum, and to anneal this I place the wire on a copper pan, which is heated over a Bunsen burner to a red heat and then immediately I plunge the pan and its contents into cold water. This thoroughly anneals the base wire so the loops can be bent without fear of breaking.

It would be useless for me to discuss the technique of constructing this appliance, but I should prefer a semi-elliptical block and block seat to the square, or the five-sided block and seat as used by Dr. Robinson, because a square block would require bending the block seat to an angle of 90 degrees, and the constant opening and closing of the seat would soon result in breaking of the same, whereas the semi-elliptical block seat would not require bending at so acute an angle, hence the liability of breaking is much lessened.

Dr. R. Ottolengui. In explanation of the fact that Dr. Waldron saw these bands so low down, it is only fair to say that he saw them on the plaster model sent to me from which an illustration was made. I do not think it possible with a plaster cast to make bands that would go up any higher than these were.

No doubt Dr. Robinson carries them nearer to the gum margin in practice.

Dr. Hawley. I would like to know whether Dr. Robinson is planning to furnish these parts to the members, or how we may obtain them.

Dr. Grieves. I have had no experience with these extremely light wires. The work I did for you some years ago was done with the Angle appliance and with gauges number 16 and 20 wire. I had the Bureau of Tests in Washington take that work up for me, so that all alloys entering into arch construction might be tested for resilience and elasticity, and the results were most confusing, particularly when heat was applied. These results varied in the German silver alloys proportionate to weight, gauge and consistence, so I reached the conclusion that alloys are very variable things, particularly the elasticity of the alloy as changed by annealing, which varied greatly when heated. A definite formula for the arch, annealed always under like conditions, in my humble opinion is the only way we will exert a definite force and get practical results such as Dr. Robinson claims. If the patient is not examined for a month or more, that seems like a long time to allow this force to act, and I fear it will vary greatly in different parts or buckles of the arch unless the wire is annealed with the greatest care.

Dr. Ottolengui. In reply to what Dr. Grieves has just said, I will say that Dr. Young has devised an annealer to cover exactly that point. He not only anneals the wire before he puts it into the mouth, but it is annealed again after soldering the parts added by being put in an electric heater, and it is controlled by a rheostat. Dr. Young claims that he gets uniform tension.

Dr. Grieves. Then his alloy must be the same in all instances.

Dr. Federspiel. How do you open the seat?

Dr. Robinson. With a small excavator spring up the extension wall of the seat.

A Member. What is the arch wire made of?

Dr. Robinson. The seat is made of iridio-platinum. The arch is made of .020″ platinum-gold.

Dr. Federspiel. How do you move the apices of the teeth forward?

Dr. Robinson. The blocks are turned in the direction indicated so as to spring the wire and then forced back into position.

Dr. Munroe. Does not that exert pressure upon the back part of the arch?

Dr. Robinson. Certainly. There is no action without an equal and opposite reaction.

A Member. Is it possible to make many movements without moving the arch?

Dr. Robinson. Practically all the movements can be accomplished without moving the arch from the seats. The elongation or spreading can be accomplished without unlocking a single block. Where it is necessary to put tension on a tooth, it is essential to unlock and change the position of the particular block intended for that tooth.

Dr. Hawley. How long does it take and how often do you have to see the patient?

Dr. Robinson. I see my patients only once a month.

Dr. Hawley. I meant relative to the action of other appliances.

Dr. Robinson. You can use the Angle appliance and widen the arch more quickly than with this, but this will require a shorter period of retention. I have a case that was passing into the third month since any pressure was applied, and the teeth are still moving. The contention is that while the pressure is more delicate than it is with a bigger form of arch and screw force, it is constantly applied over a much larger period.

I want to say this regarding the loops between the seats, that it makes no difference if the appliance itself does get out of shape, because when it is put back into the mouth the blocks are forced back into the seats again, and if they do not lie there passively the loop is bent until they do lie passively. The appliance is absolutely passive when put into the mouth. It has no tension in any direction.

I have taken out a patent on this appliance for the protection of the profession, not to make money out of it in any way, and in order to be sure that the profession will be protected in this if this association will take over these patents I would be glad to present them to the association, so that you may have the appliances manufactured properly, and if there is any profit it can go into the treasury of the association for a special purpose or any purpose you may desire.

There is just one thing in connection with what Dr. Waldron has said that I wish to speak of. The parts were beautifully made by a machine designed by a man from my city. He can make the appliance as it should be made, and if the association accepts these patents, I would like to see that this man gets a legitimate manufacturer's profit, because he has put in a great deal of work and ingenuity in making it.

Some Principles of Retention.

By Martin Dewey, M.D., D.D.S., Kansas City, Mo.

Some few weeks ago I wrote a paper on this subject and mailed it to the men who would discuss my paper, but since arriving at Toronto and listening to the discussion and the reading of other papers, I have decided to cut out about half of my talk and deal only with one phase of retention.

Fundamental Principle of Retention.

Retention may be defined as "the application of force to maintain teeth in the proper position in the line of occlusion." At first glance, this definition may be considered contrary to everything we have been taught in the past in regard to retention. I can remember when it was the common opinion among orthodontists that retention consisted in holding the teeth rigid in the line of occlusion until such a time as they might become firm. At the present time it is the application of force to maintain the teeth in the proper position with the line of occlusion, and we may say that this application of force is derived from two sources. These sources are mechanical and natural.

Mechanical Force in Retention.

Mechanical forces of retention are "such forces as are exerted by mechanical devices. These mechanical devices are divided into active and passive. The passive mechanical retention is the first form of retention that we knew anything about, and is that form which was employed when teeth were held rigid. It is based upon the opinion that in order that a tooth might become firm it must be held rigid. After attempting that plan of retention for a number of years it was found that the longer a tooth was held rigid the longer it remained loose. That is, the tissue which should support the tooth will not develop if the tooth is held absolutely rigid by a mechanical device. It has long been a law in the retention of the teeth to antagonize them in the backward direction only. Now, the important factor is the application of some mechanical device which will antagonize this backward tendency. Several years ago Dr. Watson presented a paper before the American Society of Orthodontists on "Retention," in which he outlined conditions as they existed at that time, and made the statement that orthodontists were confronted with the problem that they could move teeth, but they could not hold them. In other words, the regulating appliance had advanced farther than the retaining appliance.

Active Force in Retention.

About that time Dr. Watson and several others advocated the use of the intermaxillary rubber for the retention of Class 2 cases, and that was the beginning of active retention. So at the present time active retention, or an active retaining appliance, is one which exerts a force to overcome the backward tendency of the tooth. This force is exerted by having some sort of appliance which is active. This may be a spring from a lingual arch, or it may be a pull from an intermaxillary rubber, and whichever method it is, is the reverse to the methods, or ideas held in times past. However, active mechanical retention is far superior to passive mechanical retention, because it has been proven that in order for a part to develop it must be used. The gradual stimulating influence which is exerted upon a tooth by an active mechanical device causes the part to develop much more rapidly than it would if no such force were exerted. In other words, the use of an active retaining device stimulates the natural forces of retention, which is the same as the natural forces of occlusion. We have all recognized for a great many years the imporatnce of the force of the inclined plane as a factor in retention and as a force in occlusion, but it is only one small part of the story.

Force of Approximal Contact.

Associated with the force of the inclined plane is the force of approximal contact, which is the force exerted between the teeth of one arch upon the approximating teeth of the same arch. The force of the approximal contact is only a small point, and the teeth must be carefully placed so that this approximal contact will be normal. It is possible to have a normal locking of the inclined plane and still have an abnormal approximal contact. This has occurred in the Class 2 cases, where the lower teeth have been tipped excessively. We had a normal mesio-distal relation of the cusps, at least probably not a normal occlusal relation, but the approximal contacts were abnormal because they did not occupy the proper relation to each other. Another example may be found in the lower cuspids, or any of the lower anterior teeth, which may have a proper occlusal inclined plane relation, but the approximal contact may not be exactly right, and one of the other teeth will slip out of the line of the arch.

Force of Muscular Pressure.

Another force which holds the teeth in the proper position is muscular pressure, understood by all of us. Now, muscular pressure, or muscles of the lips and cheeks and the tongue, not only hold the teeth in their proper positions, but those muscles must act normally in order that the bone may develop properly around those teeth. There must be not only a normal action of the muscles of respiration and muscles of mastication, but everything concerning the mandible and the maxillæ in the way of a muscular action must be normal. Not only must the lips be held in contact during the entire time, but the muscles of respiration, or those muscles which depress the mandible, must also be normal, and the action of the tongue must be normal in order to maintain the width of the upper and lower arch.

Atmospheric Pressure.

Atmospheric pressure is another factor which has to do with retention, and which necessarily is closely associated with muscular activity. There has been so much said about harmony in the size of the arches as a force of occlusion that it hardly need be mentioned as a force in retention.

Cell Metabolism.

Now, the last force of retention to be considered is cell metabolism, which, to a certain extent, depends upon all the other forces which I have mentioned, and which is responsible for the success of the case. We may have all the other factors absolutely normal, or as near normal as we can get them, but if cell metabolism does not respond as it should, the case will be a failure. Dr. Noyes has said that the permanent retaining device consists of spiculæ of bone and fibres of the peridental member. They are the result of cell metabolism, and cell metabolism is the result of all these other forces.

Bone Development in Retention.

There has been a great deal said, recently, in regard to the development of bone as a factor in retention, or in regard to the development of bone as being responsible for the permanent position of the teeth. There is no doubt but that there are various means of causing and stimulating growth of bone around the teeth, but it must be remembered that if the growth of the bone is the result of the regulating appliance, or the retaining appliance, that it will be absolutely useless so far as retaining is concerned. It has been shown in the movement of the teeth that spiculæ of bone will develop and respond to mechanical stimulation. Therefore, it becomes necessary that if the bone is developed as the result of the regulating appliance, those spiculæ of bone must be made to develop in exactly the same manner as they would develop as the result of the forces of mastication and use. You may adjust a very beautiful appliance, move your teeth bodily, move the apices of the teeth and get a development of bone, which development will be true bone so far as the histological structure is concerned. But the spiculæ of bone must not be arranged to withstand the stress of mastication, but rather to withstand the stress of the regulating appliance, and as a result of the stress of the regulating appliance. A similar retaining appliance may be put on, which will continue to develop that bone, but as soon as the appliance is removed, and the teeth receive the stress of mastication, which is a different stress from the one we had from the appliance, the bone, which had been developed, will be absorbed again.

Opening the Suture.

In the experiments which I have been carrying on with dogs in relation to opening the intermaxillary suture, I have progressed so far with some of them that I have opened the suture and shown, by radiographs, that the space is filled with bone. I say this is bone because in those we have killed and examined, we have found that the tissue is bone. I have removed the regulating appliance, and the teeth have immediately returned to their old positions as the result of the absorption of the tissue which had been built into the intermaxillary suture, and this absorption has occurred as a result of the stresses of mastication, being different from the stress of the retaining appliance, or the regulating appliance. I believe if those teeth had been held apart for years, when the appliance was removed, the return to the old position would have been just as rapid, because the bone was developed as the result of unnatural force. Also, the force of muscular pressure and force of the inclined plane was abnormal, which, of course, would cause the bone to be absorbed.

In closing, I will say that the solution of retention lies in the construction of a mechanical device, which will allow the teeth to respond to all of the stress of mastication. The teeth must be held loosely and so as to antagonize the back direction, which can be done by some form of appliance which will allow them to move, as the result of the stress of mastication. Furthermore, the solution of retention does not lie in the stress of bone development, but lies in obtaining a normal action of all the forces of occlusion, and this normal action can only be obtained by the use of appliances that will not interfere with mastication. Also, that permanency in retention depends upon the normal action of natural forces of retention, and the sooner we become familiar with the natural forces of retention and with what these forces will do, the sooner will we have permanent results, and not be compelled to see our cases relapse, as we have in times past.

Discussion of Dr. Dewey's Paper.

Dr. Lloyd S. Lourie, Chicago.

I am rather at a disadvantage in discussing Dr. Dewey's paper, because his lecture has been materially different from the written paper which he furnished me.

There are one or two points I noted while he was speaking that I want to refer to and one is this: He says it is impossible to retain the teeth if cell metabolism is faulty or if we have insufficient tissue development. That might account for one of the difficulties many of us have had in connection with retention. We make a mistake in undertaking treatment when it is practically a physical impossibility because of being hampered with faulty cell metabolism and insufficiency of tissue to accommodate the changes we wish to make, and for the same reason I would take issue with the statement that there is no question about getting bone development where we wish it. Dr. Dewey may be able to do that, and if he is able to do it, I would like him to give us a carefully prepared paper explaining just how he can get bone development where and when he wishes and to any extent he desires, because I cannot accomplish what I wish in the way of bone growing, and there are some things I will not undertake because I realize my limitations in that respect.

I wish heartily to indorse the main point of Dr. Dewey's paper, which is this: It is necessary not only to get the teeth into normal occlusion or normal contact and cusp relation but to get all the forces which influence the teeth in normal correlation as far as possible. It is not always possible to get all of these forces working normally, and I thought of that particularly in listening this morning to the paper of Dr. Grieves when he explained those factors that influenced bone development over which we have absolutely no control. We may get all the factors influencing occlusion over which we have any control into good normal condition, and yet fail because of other factors influencing growth and development over which we have no control.

The second point of the paper points out very clearly that it is necessary to construct retaining appliances in such a way as to allow freedom of tooth motion. That is quite important. The appliance should be so arranged that the teeth can respond to the natural impact of occlusal and muscular force. I may say here that it is almost impossible, so far as I have been able to learn, to devise a retainer that will absolutely do this. We simply have to select an appliance that offers the least hindrance to normal function and then eliminate it as soon as it is possible to do so, substituting the natural forces of retention. But we must also remember that we cannot retain a tooth mechanically for any preconceived length of time and remove the retainers and expect Nature to do the rest. It has been too commonly the custom to consider our active work in treatment finished when the retaining appliances are put on, and that all we need to do is to see that these retaining appliances stay in place during the prescribed length of time. But our efforts will not be attended with success unless during the time the appliances were being worn the natural forces of retention were being developed. That is a line of thought upon which we can well expend a good deal of effort in determining how we can best develop muscular balance for one thing and general tone and vigor for another, to assist mechanical retention.

Dr. Frank M. Casto, Cleveland.

I am in the same position with Dr. Lourie, in that I cannot see very much relation between the paper by Dr. Dewey and his talk, although both have been quite interesting to me.

We all agree with Dr. Dewey that retention is one of the most important parts of the orthodontic procedure. In fact, it is the final word in every case. No matter how beautiful the results of the operative procedure may be, if the retention is not properly cared for there will be untimate failure.

There is one other point in connection with retention which must be considered, and that is growth during the retaining period. A rigid retaining appliance should never be placed for a long period during the time of development. There are many forms of adjustable appliances which can be used in such cases.

I would like to say also that I believe in the use of removable retaining appliances. There are many cases where they are a distinct advantage, especially in the latter part of the retention. Let me also mention the use of a plate. In some cases where the upper incisors have been moved lingually and you wish to hold these indefinitely, it can be done by the use of a plate with a labial wire. Many patients will willingly wear such a retainer a part of the time, at night, and it is just as effective. It allows also for any individual tooth movement and does not interfere with the function.

Dr. Ottolengui. Will you please tell us how you place the wire?

Dr. Casto. I vulcanize it in the plate. I bring it over, as a rule, between the first bicuspid and cuspid, fitting it close between the two teeth just in the anterior region, that is, in cases where I have made expansion of the arch and also wish to hold the anterior teeth.

I wish to impress again the importance of function. We must have function of the teeth in order to have a healthy condition and development, and the appliances must not interfere with this.

Dr. Federspiel. It may seem ignorant on my part, but I do not quite understand what is meant by cell metabolism. I wish Dr. Dewey would make that clear to me.

Dr. Kemple. I did not catch the meaning of Dr. Dewey's remarks in regard to the development of the mandible. If I understood him, he referred to the relation between the underlying bones and the dental arch.

Dr. Dewey. By cell metabolism I mean cell growth, and cell growth is the basis of all development. If you move a tooth you must get normal action of cells which fill the peridental membrane and alveolar process which keep on building. There are various things which interfere with that, as has been shown to-day, but you must remember them.

Dr. Kemple asked what I meant by developing the underlying structures supporting the dental arch and alveolar process. I mean the body of the mandible will develop as a result of the normal forces of occlusion and the normal forces of retention. The receding chin and underdeveloped mandible you get in the lower arch associated with mouth breathing as the result of the abnormal stress of respiration. The mandible has various functions, one of which is the function of respiration which is controlled or influenced by the muscles from the hyoid to the mandible. The mandible has function in speech, and according to a great many investigators, the reason man has a greater chin than the ape is because man talks. When you change a set of teeth from malocclusion to normal, the normal action of the muscles of respiration causes the chin in man to develop. If you move the lower teeth forward bodily and set them in proper position, they will cause the mandible to develop. I can show you photographs of patients before and after, showing that the mandible has increased in length.

Dr. Kemple. May not that be changed in relation to the temporo-mandibular articulation?

Dr. Dewey. You cannot change the temporo-mandibular articulation.

Dr. Kemple. How about all the Class II and III cases that have been treated?

Dr. Dewey. I can show you a few X-rays of such cases in which it has not changed. I can show you X-rays that point out that after these conditions have been treated they are the same as before. The temporo-mandibular articulation anatomically is surrounded by ligaments so that the mesio-distal relation cannot change.

Dr. Kemple. Yesterday I showed the model of a case of a young lady, twenty-two years of age. It was decidedly a Class III condition. At least, all the lower incisors and cuspids closed mesially to the upper cuspids, and that relation was changed within six months without any apparent tipping of the upper incisors. Do you mean to tell me you can produce sufficient growth of bone in that length of time to account for that change, if the mandible has not slipped back in the temporo-mandibular articulation? The maxilla must be moved forward. Does such growth of bone take place in that comparatively short time?

Dr. Dewey. I cannot say it did in that case, but it would be possible for it to do so. There is no reason why bone should not grow as rapidly in the region of the teeth and alveolar process as anywhere in the body. We know that after a surgical operation bone tissue will fill in the space in a comparatively short time. The reason it takes so long before it develops around teeth is because abnormal conditions are present. There are few cases of Class III which are the result of luxation, where the mandible is moved forward accidentally and which may return to a normal position as the result of treatment. In Class II cases, or distal relation of the lower teeth, I do not think the condyle moves forward, and if it does you do not want it to, because I do not believe you can hold it there.

Dr. Young. If you take a child, eight years of age, with a Class II condition, widen the upper arch, put nothing on the lower arch, and simply make an attachment to the first cuspid and first permanent molar on each side to carry a lingual arch and to keep the expansion, how do you account for the fact that the lower teeth move into normal occlusion if there is no change in the temporo-mandibular articulation?

Dr. Dewey. The articulation remains unaltered, the condyles slide back, and the mandible moves forward. The condyle will slip backward coincidentally with the development of the body of the mandible. My contention is you cannot keep the condyle forward in its normal position.

Dr. Kemple. Is it not possible to establish a new seat for the mandible in that joint, just as they make a new hip-joint in the Lorenz operation?

Dr. Dewey. It might be, but I do not think you would ever do it. Anything is possible.

Dr. Kemple. Is not the Lorenz operation a successful one?

Dr. Dewey. It is in some cases, but it is not the establishment of a new joint. I do not think you can say that in the Lorenz operation a new joint is established.

Dr. Ottolengui. I do not think it is quite fair to compare those two operations establishing a new hip-joint and changing the position of the condyle. You have all of you seen thrown on the screen pictures of skulls, and the lecturer has said, "this is the skull of a child at the age of three months, observe the glenoid region. This is the skull of a child at six months, and this the skull of a child at ten months," but, as a matter of fact, you can find all of the normal variations in some degree in young children, and sometimes at a very early age, you may have a deep fossa and a high eminence and the position of the condyle could not be changed unless you cause resorption of the eminence. But it is my conception that in some children the eminence is so flat at the time of operation, that it may be possible to hold the mandible forward long enough so that the glenoid fossa will assume such shape as will establish the position permanently. This is pure speculation on my part, but it has been my experience, as Dr. Young pointed out, that in some instances without any help whatever the mandible will slide forward and remain there. In other instances it will go back in spite of long retention.

Dr. Dewey. My opinion is based on comparative embryologic and anatomic evidence. The anatomic evidence is based on examinations of skulls I could find or hear of that showed Class II and Class III conditions. In distal relation of the lower arch the mastoid process, the external auditory meatus, and the condyles occupy the same relation. Then you will find cases in which the shape of the condyle does change as a result of the abnormal occlusion. You may compare the mesiodistal relation of the condyle with those other landmarks in the same position, but the shape is different. In the case Dr. Young mentioned, where the mandible moves as the upper arch is widened, the mandible moves forward as the result of muscular effort, but the condyle is brought back to its old position by lengthening of the body of the mandible in a short time, say in two or three weeks. The action of the tongue on the lower anterior teeth will cause the body of the mandible to move forward or to lengthen; but in asking these questions you are getting off the question of retention which is another proposition.

Report of Cases

By W. G. Barr, D.D.S., Wichita, Kansas.

Case A. Patient: Woman, age nineteen years. Class I. Upper central incisors separated three millimeters. (Fig. A1.)

Cause: Abnormal frenum labium.

The frenum labium is attached to the upper lip at the median line and extends downward, when normal, nearly to the festoon of the gums between the central incisors. When abnormal, it extends between and to the lingual side, where it is attached to a groove or depression just forward of the anterior palatine foramen, separating these teeth to a greater or less degree, according to its size. If the frenum is the cause of this separation, it may be diagnosed by lifting the upper lip and drawing from side to side. If attached abnormallly, the frenum will be seen to pull between the central incisors.

Treatment. Plain bands were made for the centrals, with bars attached to the labial side of the bands, parallel to the axes of the teeth, extending five millimeters above the gingival margin of the gum. This makes it possible to move the apex of the tooth with the crown. About three months' time was required to move the teeth to their normal position. The abnormal frenum labium was then dissected out and retainers were placed on the centrals for six months. (Fig. A2.)

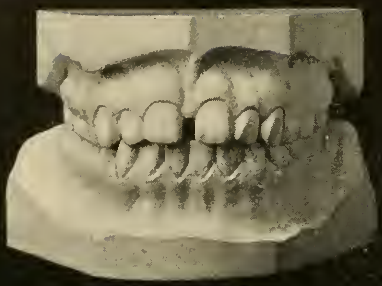


Fig. A1.

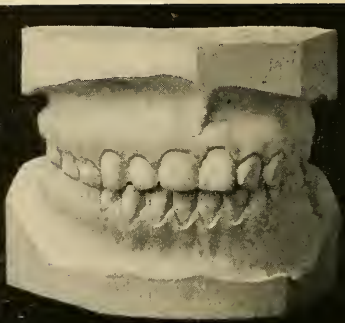


Fig. A2.

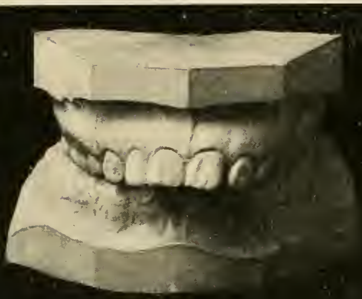


Fig. B3.

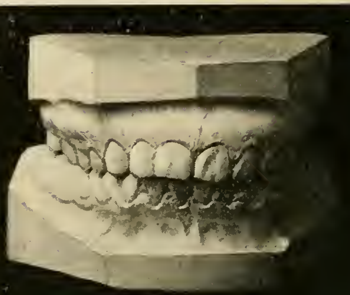


Fig. B6.

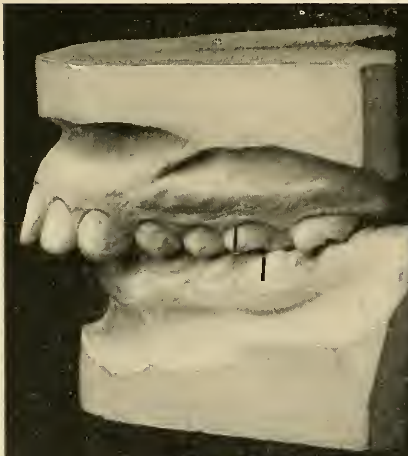


Fig. B3.

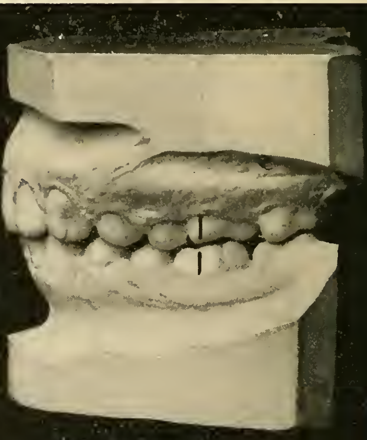


Fig. B6.

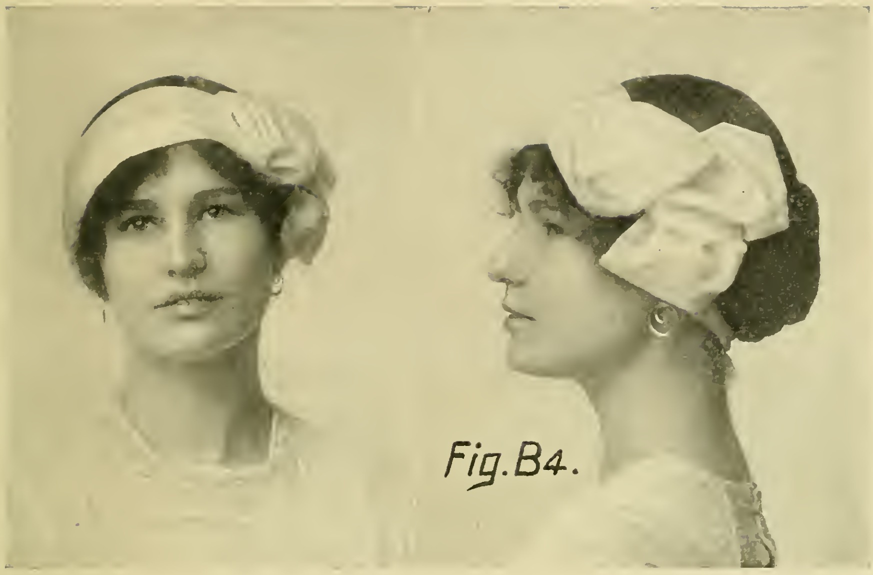


Fig. B4.

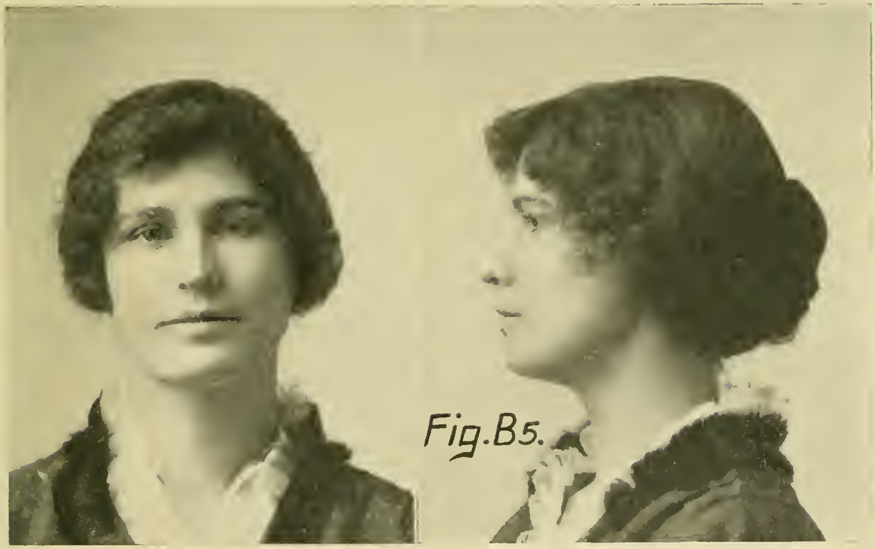


Fig. B5.

Case B.

Patient: Female, age seventeen years. Class II. The lower arch distal to normal. Upper central and lateral incisors protruding. (Fig. B3.) The effect upon the face was most unfortunate, giving a very weak expression from the nose downward. (Fig. B4.)

The effect of this treatment upon the face was most marked, but only what would be expected by those who understand the laws of occlusion and occluso-facial balance.

(Fig. B5.) Notice increased strength of the mouth and chin—the apparently improved mental poise.

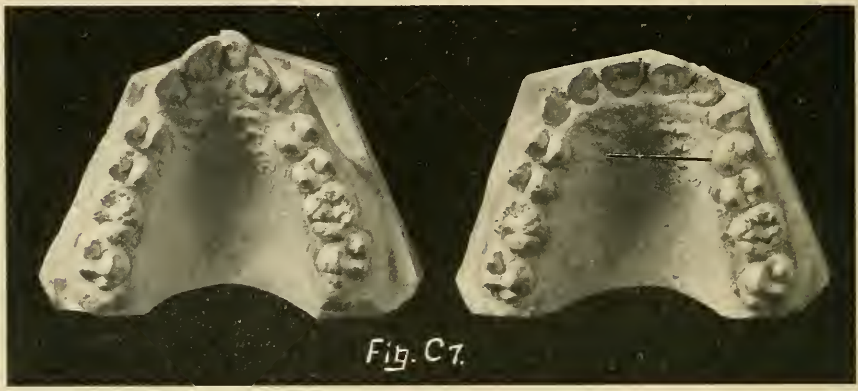


Fig. C7.

History.

Mouth breather; adenoids removed about two years before coming to me for treatment.

Treatment.

Molar clamp bands were placed on the upper and lower first molars and arches were then adjusted. Hooks were placed on the upper arch opposite the cuspids for attaching intermaxillary rubbers. After the patient had become accustomed to wearing the appliance, intermaxillary force was then applied to move the teeth. It required nine months to move these teeth into normal relation. (Fig. B6.) Retainers were then put on in place of the appliance and the teeth retained with intermaxillary force for about seven months. I consider Class II cases the easiest type of malocclusion to treat.

Case C.

Patient: Age fourteen. Class II.

In this Class II case both arches were constricted. Fig. C7 shows an occlusal view of the upper arch. Note the expansion in the first bicuspid region; the line drawn between

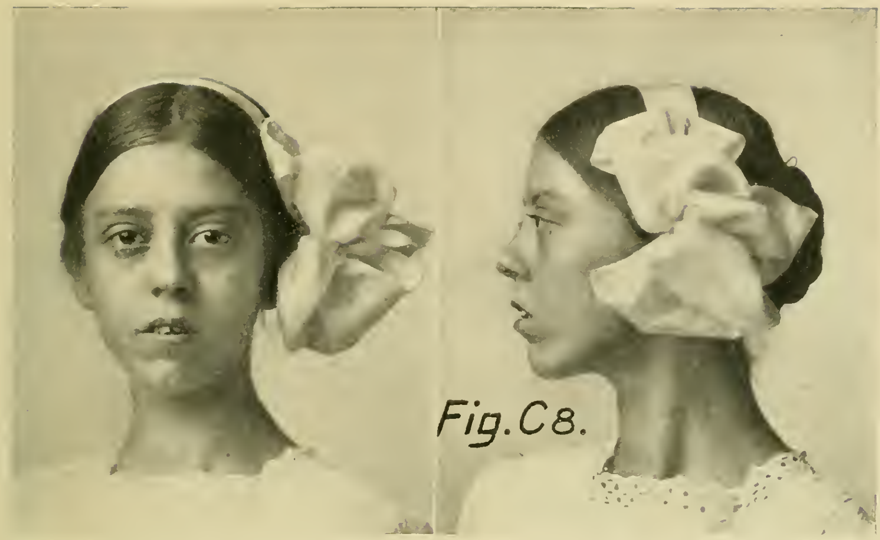


Fig. C8.

the first bicuspids on the finished models represents the distance between the first bicuspids before treatment. The lower arch was expanded in proportion to the upper. Had I extracted the bicuspids on either side from the upper arch and moved the cuspids down and back, as was the accepted treatment of such cases a few years ago, the result would have

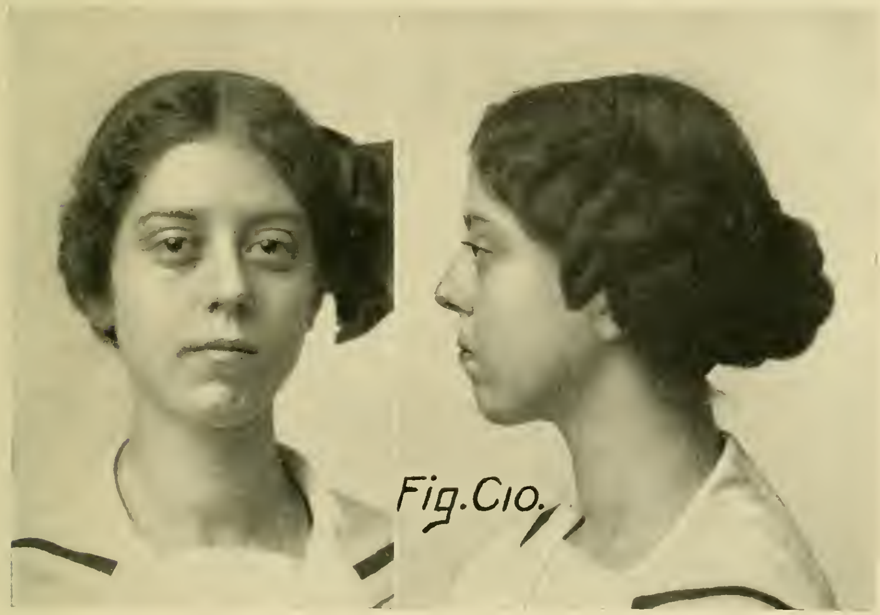


Fig. C10.

been to make a poor masticating apparatus less efficient, and to have made the lower third of the face, which was lacking in development (Figs. C8 and C9), still weaker, but what is of more vital importance, the nasal space shows restoration to normal conditions through the course of treatment followed.

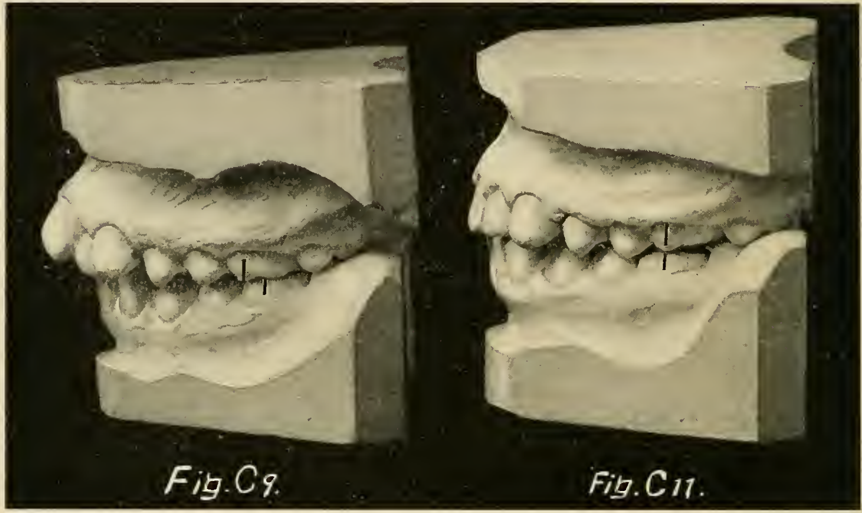


Fig. C9. Fig. C11.

The following report from Dr. Palmer gives the condition of the patient before coming to me for treatment and after completing my treatment:

Dear Doctor:

Regarding case of Esther Berkland, age fourteen, examined by me March 9, 1912, I found in her a mouth breather, depressing hearing, medium sized tonsils adherent to the anterior pillars, high arched palate. adenoids and nasal septum badly deviated to the right. The other conditions were such as accompany the above.

Now, fourteen months after the removal of the adenoids and your treatment on the teeth, I find the nose and throat conditions much improved, septum practically straight, nostrils open and clear, and she says she has no trouble at all now to maintain nasal respiration.

Sincerely,

Edw. M. Palmer.

Figs. C10 and C11 show photographs of patient and models after treatment.

Reports of Clinics.

Dr. Lloyd S. Lowrie,
Chicago.
Clinic I.

A combination of lingual and labial arches to retain, without bands, upper incisors which have been retruded, intruded or rotated. Specially recommended for secondary retention, though frequently valuable in tooth movement.

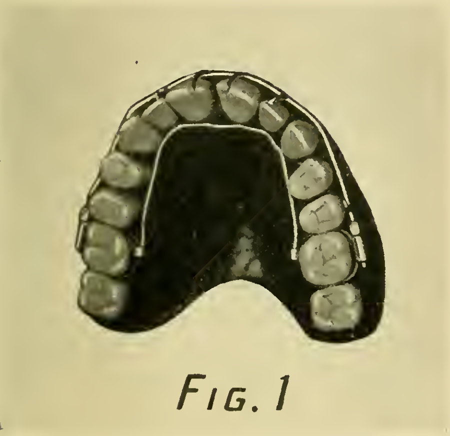


FIG. 1

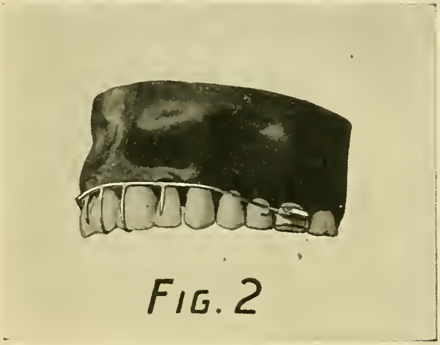


FIG. 2

Lingual arch, gauge 19 iridio-platinum, stationary or removable from the anchor bands, and in contact with the incisors at gingival ridge. (Fig. 1.) Ordinary expansion arch on labial, fitted above the teeth, but not in contact with the gums, and with twenty gauge iridio-platinum extensions to points on the labial surfaces or over incisal edges of the teeth wherever pressure is desired. (Fig. 2.) Individual tooth adjustment obtained by bending the various prongs for tighter contact or by changing the pressure exerted by the arches.

Until incisors are quite stable, labial arch to be tied in place and only removed by the orthodontist. Later, to allow removal by the patient, it may be held in place by elastic bands extending from hooks on the arch and over the buccal tubes on the molars.

Advantages: Avoids the use of bands which take up valuable space at interproximal and occlusal contacts, and are an element of danger to tooth structure. Is less conspicuous than bands and in secondary retention may be worn only at night or for such periods as the orthodontist thinks best.

When not being worn the labial arch should be kept on a form of modeling compound (Fig. 3) to protect it and to allow the patient to detect any accidental change in its shape.

Clinic II. The second clinic showed an improved shaping of beaks on Angle wire stretchers. Shallow cross grooves are made in the beaks, close to the tips, to give a more secure hold on the wire, enabling the operator to either keep the wire straight or bend it as a result of the pinch. The groove also directs the compressing of the metal, giving more stretching per pinch and making a longitudinal ridge across the pinch, which leaves the wire stronger than when plain beaks have been used. By trimming beaks with cone or inverted cone surfaces, the ends of the wire may be made to bend away from or toward the pliers.

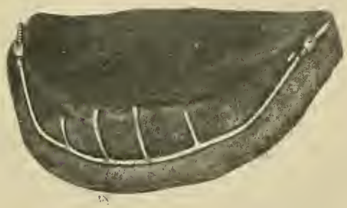


Fig. 3

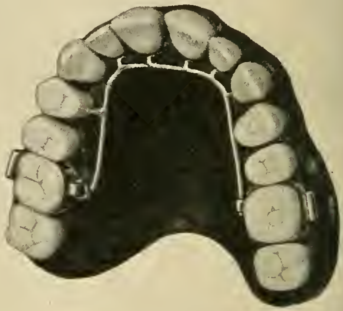


Fig. 4

Communication Received Nov. 1914. Enclosed find an illustration of what I consider an improved lingual arch construction. (Fig. 4.) There is no contact with the teeth except by chisel shaped ends of the extensions from the lingual arch which lies along the gum, slightly above the gingival margin. This arrangement gives greater security at the contact points as well as being more easily cleaned, and consequently is less liable to injure the teeth or gum margins. It is fastened to the anchor bands by either round or flattened tubes, but slips into the tubes from the distal side and is locked on the mesial of the tubes. This allows the lingual arch to be removed and replaced without bending, as was frequently necessary formerly, when slipped in from the mesial.

This is an improvement on a part of my Toronto clinic.

A. Kingsbury,
Columbus, Ohio.

Dr. Kingsbury exhibited appliances for free-hand pin soldering. Fig. 1 is a steel broach mounted in a handle for picking up solder rings (from a flat white porcelain dish or tray), and with it the ring is opened just enough to grasp the pin by being slid to a certain point on the tapered broach.

The arch is supported at three points without torsion during the soldering of each pin by the instrument shown in Fig. 2, which has two arms, each ending in a spring clip or tweezers (side view shown), with a central wire finger between the arms (soldered to the pivot). The width of the separation of the arms, and the position of the central support, can be adjusted to suit the shape of the arch, and the arms with the arch can be turned to the right or left to bring the pin in line with the handle, as may be convenient in attaching the pins which are away from the center of the arch. The perfect balance is an aid to accurate and delicate handling.

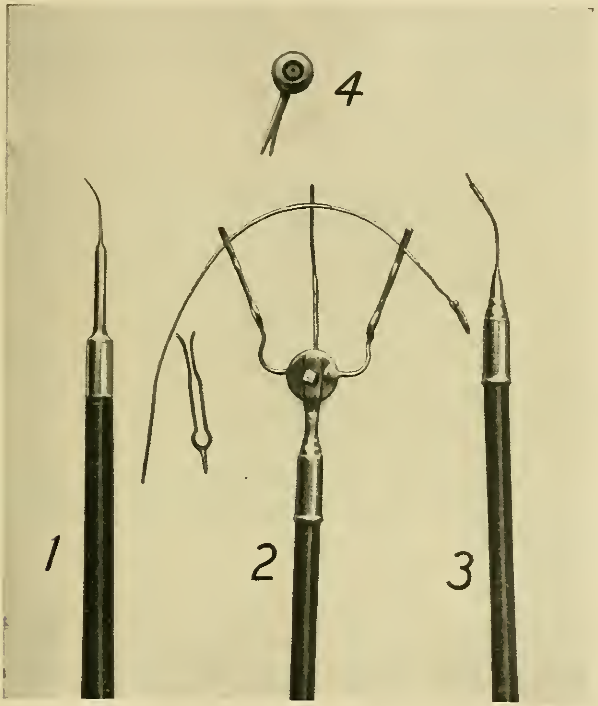


Fig. 3 shows a pin-holder made from an iridio-platinum pin-tube soldered with pure gold to an iridio-platinum wire and mounted in a handle of convenient length.

Fig. 4 shows the tip of the blow-pipe to which has been soldered a narrow extension of brass plate with a notch in it, which is used to secure contact of the solder ring and the arch, at the moment of approaching the flame, when both hands are occupied in holding the arch and pin.

If the arch be accidentally bent toward the flame at the point where it was notched, this can be corrected better by putting the arch across the square horn of the bench-anvil, with the pin in the small hole in the anvil, and tapping lightly, than by any manipulation with pliers.

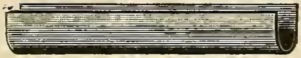


Fig. 1. Enlarged.

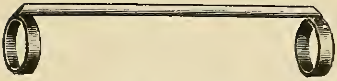


Fig. 2. Enlarged.

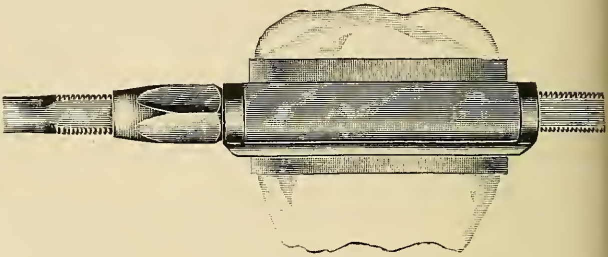
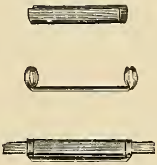

Enlarged.

Fig. 1.

Fig. 2.

Fig. 3.


Actual size.

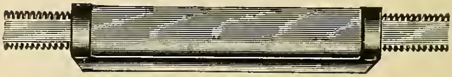


Fig. 3. Enlarged.

C. W. B. Wheeler,
New York City.

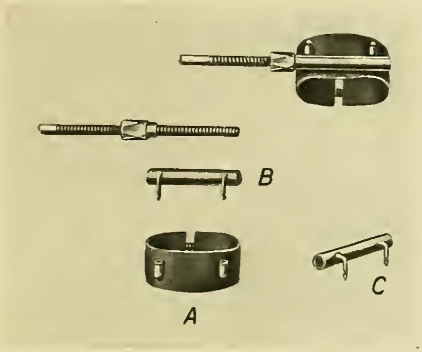
The clinic consisted of showing a simple lock for use with the new Angle appliance. By its use a one-picee arch can be used with upright pins. A case may be started with the ordinary arch and then changed to a new one without removing the molar bands or tubes, and when it is necessary to use the nut posterior to the tube, it can be placed on the arch before inserting, and thus do away with the difficulties of putting on after it is in position.

The one-piece arch has the advantage of having a long portion perfectly smooth that can be extended close up to the nut and does away with a break which is a source of weakness.

A flattened or oval tube, with one side open (Fig. 1) is soldered to the molar band. This can be of any length that is desirable, and with this tube it is, of course, necessary to use an arch with the flattened ends. Before inserting the arch, the lock (Fig. 2), which is made just long enough for the tube, is slipped over the end. After it has been placed in position in the mouth, the wire connecting the two rings of the lock is forced up and over the tube by means of an excavator or some suitable instrument until it rests in the groove that is formed where the band and tube is soldered together.

Fig. 3 shows the lock and arch in position. A loop may be made on the arch and the nut done away with, or both may be used.

After the lock is in position, a small piece of wire may be soldered to the ends of the arch, then cut off so as to form small projections, and this will keep the lock fastened to the arch when it is taken out for cleansing. This does away with any chance of its dropping off and being lost.



Dr. R. W. Gaston,
Gulfport, Miss.

The New Appliance, as devised by Dr. Angle for the correction of cases of malocclusion, I think, is one of the greatest steps in advancement that the specialty of orthodontia has experienced for some time. It requires more skill and accuracy in its adjustment than the old-style expansion arch, but it gives more accurate results.

I have devised the following plan of adjusting the arch to the tube of the molar band, which makes its operation more simple and requires less time for removing and readjusting.

Instead of the separate screw section slipping into the molar tube and being tightened up to receive the arch section, it is soldered to the arch section permanently, and the tube of the molar band is unsoldered, and instead of being fixed to the molar band has a pin and tube attached similar to the ones used on the anterior teeth. However, the molar band should have two tube and pin attachments instead of only one. After the tube has been removed from the molar band, two small delicate tubes (the regular Angle pin and tube may be used) are soldered, one at the mesio-buccal and the other at the disto-buccal angle of the band, and are placed crosswise of the band or perpendicular to the long axis of the tooth, as at "A"; next two pins of a size to fit these tubes are soldered to the detached tube of the molar band in such position as to exactly telescope into the perpendicular tubes. These pins are notched at the gingival ends so as to lock when pressed into place. The notches, however, are turned opposite each other, one pointing mesially and the other distally, so that they can be slightly sprung apart, giving them a firmer "catch" when placed in the tubes, "B."

In soldering the pins to the horizontal tube it is necessary to solder them to the side of the tube next the tooth, so as to allow for the curve of the tooth, and in some cases, especially on very short teeth, it is necessary to place the pins near the top of the tube; first having bent them so that they will extend downward or gingivally into the tubes as shown at "C."

In operation, the threaded end of the arch is slipped into the tube having the pins attached, and the pins are then pressed into their respectives tubes on the molar band, at the time when the other pins on the arch are slipped into the tubes on the anterior teeth.

This does away with the necessity for the separate screw section, making it more simple in adjusting and consumes *much* less time in removal and replacing for treatment. It also has the advantage of allowing either simple or stationary anchorage of the molars, as regards their buccal movement, the same as the appliance now in use by using either the round or oval buccal tube.

Dr. H. D. Keeler, Des Moines, Ia.

I would like to describe an appliance which I have found quite efficient in the last period of retention for Class II cases. The appliance is placed on the upper arch and consists of two strong molar bands—lingual arch bar of I. P. wire and about in the region of the cuspid, on either side—an inclined plane which will catch the lower anterior teeth.

I find that after the intermaxillary force has been used for some time to correct the distal occlusion, and perhaps for some time as a retainer, I wish to discard the same for something that needs but little watching, and I have found this appliance very useful.

Make strong clamp bands for first molars. Solder to same, lingual arch bar I. P. wire, 18 gauge, allowing arch to rest firmly against six anterior teeth, close to the gingiva and out of the way of the occlusion. Solder to lingual arch bar, one on either side in region of cuspid, a V-shaped loop of I. P. wire, 18 gauge (V-shaped loop should be about one-quarter inch wide, about the same in length), soldered to the arch in two places, extending down and back at the proper angle. A good bite must be secured to enable one to solder these loops on the arch at exactly the proper angle, to catch the lower anterior teeth. I have not found that the lower teeth, striking the planes, will be moved individually. A small labial arch on the lower would obviate any danger from this source. If there is a lingual arch bar on the lower it should be placed very low or the same would strike the planes when the jaws are closed.

Demonstration.

By Victor Hugo Jackson (M.A., M.D., D.D.S., New York).

Showing Forty Models and Appliances, Describing, Plan of Designing and constructing the Jackson Movable Regulating Apparatus.

The new anchorage of appliances requires that a thin, broad collar with a buccal lug of triangular shape, like a door latch located to rest near the gum at the center of the tooth, be cemented to the last erupted molar on each side of the dental arch, and a similar collar with a buccal lug be cemented to each of the cuspids, or if the cuspid is absent, the collar be cemented to one of the other anterior teeth. Often lingual lugs are used for these purposes. (See Fig. 1.)

When the collars are cemented to the anchorage teeth, an impression of the arch is taken and accurate models are prepared, on which an appliance is made.

The metal parts of an appliance are known as partial-clasp, spring-clasp, base-wire and springs. Of each of the last two, there are several forms. The metals employed are usually of German silver spring wire. Spring wire containing more than 20 per cent. of nickel (known as silver nickel) is generally used, and when carefully drawn it is usually sufficiently springy.

A partial-clasp of 18K. gold plate-metal No. 36 U. S. standard wire gauge, shaped with a contouring plier, is fitted to the lingual surface of each of the cuspids, bicuspids and molars of the model on each side of the arch.

The foundation of an appliance is a base-wire usually of a rather large diameter.

The size or gauge of the base-wire is chosen according to the age of the patient and density of the bone. A spring-wire No. 13 U. S. standard wire G. being used for a child of four years, No. 11 base-wire

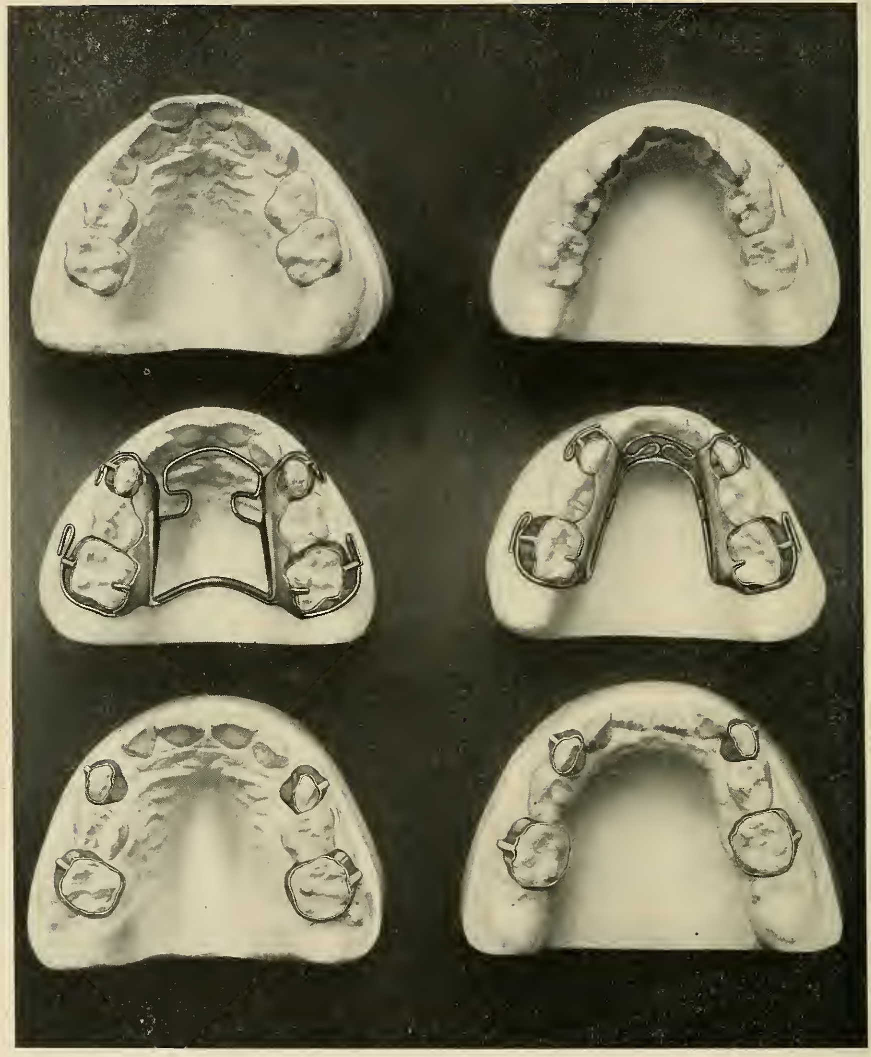


Fig. 1.

for a child of eight years, No. 10 for a child twelve years of age, or for an adult; for the adult occasionally No. 9 G. is employed.

In any case where the anterior part of the dental arch requires lateral expansion and the distal part of the arch does not require lateral expansion, the body of the appliance is made by arranging a large base-wire to cross the distal part of the arch opposite the last molars following the palatine curve. The ends are bent forward to form arms, extending from the last molars to the cuspids, resting on the partial-clasps near the gum on the lingual side of the teeth, to which they are finally soldered. These ends of the base-wire are made less bulky by dressing them with a file, especially near the ends, or at locations that will not lessen their strength.

Palatal Base-Wire. When both the distal and the mesial parts of the arch require lateral expansion, a similar base-wire is first formed into a U-shaped loop extending forward as far as can be in the deep part of the palatal vault, with the sides extending backward to the distal part of the last molar, and then be curved forward, forming arms extending from the last molars to the cuspids. This latter form of base-wire is known as a *palatal base-wire* with a *U-shaped loop*.

The *action* of the appliance with the simple palatine base-wire for causing the lateral expansion of the anterior part of the arch is brought about by pulling outward on the front ends of the arms of the appliance that rests on the cuspids, at regular intervals; bending the base-wire a little and re-inserting the appliance, gradually moves those teeth outward.

Lingual Base-Wire. For making appliances for the lower arch a *lingual base-wire* is employed. The lingual base-wire is shaped to follow the lingual curve of the lower arch near the margin of the gum extending backward to about the center of the last molar of the arch, where the ends are bent forward, forming arms to cross the partial clasps near the gum as described for making an upper appliance.

For completing the anchorage of the appliance, a wire-clasp made of No. 19 or 20 gauge spring-wire is shaped to pass from the lingual base-wire around the last molar to the buccal side to rest between the lug on the collar described and the gum. The ends of the wire-clasps always terminate in a loop, similar to a small hook, so that in unlocking the device one's fingers will not be pricked or injured in springing outward the ned of the wire-clasp for unlocking the device, also the hooks on the clasps are utilized when necessary for supporting rubber equalizing bands for equalizing the dental arches antero-posterially.

Similar wire-clasps of No. 20 gauge are shaped to pass from the lingual base-wire over the arch at the junction of the lateral incisor and cuspid to the buccal side, to engage with the lug on the collar, one on each of the cuspids.

In some instances it is not necessary to cement a collar to the molar, as if the tooth is well erupted, a wire-clasp or plate spring-clasp is sufficient.

Finger-springs for moving the teeth are arranged to extend from the anchorage portions, or arms of the appliance to the lingual or to the labial side of any of the teeth for moving them outward or inward, for their rotation, elevation, depression, etc.

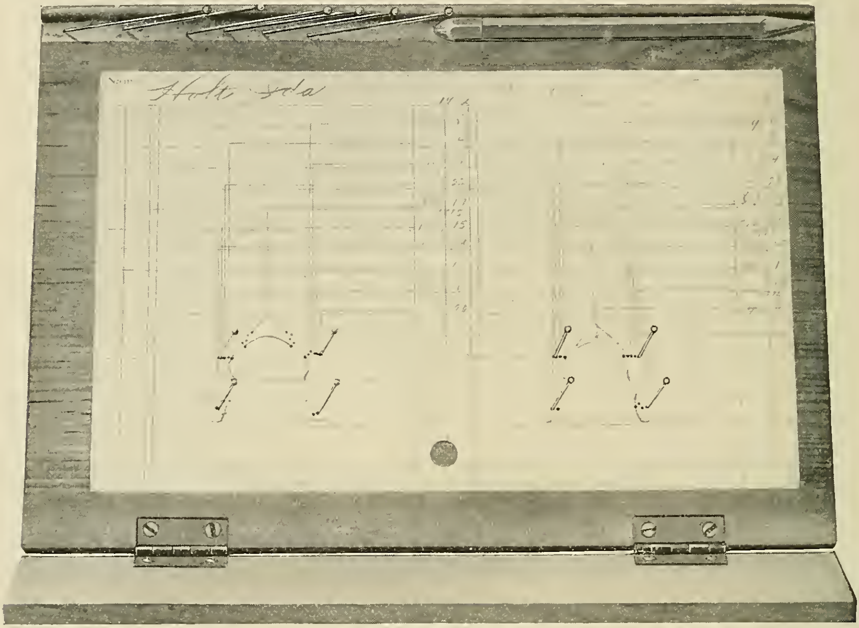


Fig. 2.

Spurs are extended from the base-wire to the grinding surface of some of the teeth to prevent the appliance from resting on the gum.

After the several parts are shaped and arranged on the model they are treated with a flux, chloride of zinc, and united with chemically pure tin as a solder, being fused by a large soldering iron. The appliance is then dressed and polished.

The appliance being made with arms and fingers in this manner permits the arms to be bent outward to cause lateral expansion of the arch, and when the teeth are sufficiently moved, causing space, these irregular teeth are moved by re-shaping the metal fingers, or arms, as desired.

This plan of anchorage is suitable for the regulation of the deciduous or of the permanent teeth.

Advantages of Early Treatment.

The advantages of early regulation of the teeth is principally for increasing nasal space, while the arches are in their developmental stage, to improve the breathing, for causing room for the proper eruption of the permanent teeth, etc., which is described with models and apparatus.

The models of two cases of irregularity of the teeth of children four years of age were shown, illustrating the condition before and after expansion and movement of the teeth with movable regulating appliances.

With the collection were shown models of the upper and lower dental arches of a child four years old, before and after regulating. The child had upper protrusion and very narrow arches. Accompanying the models were a record card and an upper and lower appliance used for correcting the irregularity by the expansion of the dental arches. The arches were expanded and equalized antero-posterially by the use of rubber equalizing bands.

Apparatus for the regulation of various irregularities of the teeth were shown as for upper protrusion, prominence of the lower teeth and mandible, elevation and depressing of incisors, the correction of the median line of the arch, warping of the arch, etc.

The use of the record card on a tracing board (Fig. 2), devised by the author, was shown and the plan described, for controlling the exact measurement of force of the appliance in each application, which reduces orthodontia to an exact science, and from its application prevents tenderness of the teeth in their movement. Additional force is applied once a week. At first make a measurement of one-half millimeter and later increase the mesurement a little. The appliance is easily removed by the patient or nurse for its cleansing and for the cleansing of the teeth.

In designing and making movable appliances the irregularity of the teeth is carefully studied with the assistance of accurate models, and a design of a suitable appliance is determined upon. From this a pencil drawing representing the design is made in a duplicating book with carbon. The design is dated and numbered.

One copy of the design is removed from the book to guide the laboratory man in making the appliance. With the appliance it is returned bearing the maker's name.

The duplicate design of the appliance is dated and remains in the book as a permanent record for reference.

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